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The task of matching people to jobs is made difficult by the cumulative effects of change. Flexibility of the labor force has decreased because of the lack of low skill jobs and the increased employment of women and minority groups. Oregon's research efforts, prompted by need for data by public and private sectors, was directed at ways of obtaining data for educational planning. The central question was one of obtaining maximum return from education's efforts in preparing persons for work and was based on the presumption that public education cannot do it alone. In order to determine the occupations which should receive priority in resource relocation for training programs, three techniques were explored and demonstrated. These were questionnaires, projections by regression techniques, and interindustry analysis and projection (input-output analysis). All three were considered to be supplemental to other available information and subordinate to final analysis by professional and lay policy makers. Interindustry analysis and projection was considered by the researchers to be the most useful technique, but dependence on the others was also necessary. Demonstration of the techniques was with national and Oregon data and considered a necessary step to utilization. (JM)

Oregon Statewide Study of Systematic Vocational Education Planning, Implementation, Evaluation:

Phase I - Manpower Needs, Data Collection Devices and Occupation Clusters

EXHIBIT A

The research reported herein was performed pursuant to a contract with the United States Department of Health, Education and Welfare, Office of Education.

BUREAU OF EDUCATIONAL RESEARCH
and
BUREAU OF BUSINESS AND ECONOMIC RESEARCH
University of Oregon
Eugene, Oregon

December, 1965

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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OREGON STATEWIDE STUDY OF SYSTEMATIC VOCATIONAL EDUCATION PLANNING, IMPLEMENTATION, EVALUATION:

Phase I - Manpower Needs, Data-Collection Devices and Occupation Clusters

by

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A study completed by the BUREAU OF EDUCATIONAL RESEARCH and BUREAU OF BUSINESS AND ECONOMIC RESEARCH, University of Oregon under contract with the DIVISION OF VOCATIONAL EDUCATION, Oregon State Department of Education

December, 1965

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UNIVERSITY OF OREGON
Eugene, Oregon

Dr. William Loomis, Director
Division of Vocational Education
State Department of Education

Dear Dr. Loomis:

Herewith is transmitted the report of Phase One of the *Oregon Statewide Study of Systematic Vocational Education Planning, Implementation, Evaluation* developed by the staffs of the Bureau of Educational Research and the Bureau of Business and Economic Research, University of Oregon.

Technology, innovation, job obsolescence, knowledge explosion and other technological and social forces have relevance in designing a meaningful curriculum for a contemporary society. Appropriately, vocational education is emerging as a prime responsibility of the American public school system. The Division of Vocational Education, State of Oregon, is to be commended for its analytical approach towards developing a purposeful and comprehensive curriculum in this important field.

In making this study, the Bureau of Educational Research and Bureau of Business and Economic Research have received valuable assistance from many sources. The labor analysts provided by the Oregon State Department of Employment supplied technical materials and guidance. A diversified team of educators analyzed the job descriptions and developed curricular elements. The University of Oregon Counseling Center was most helpful in providing an analytical critique of the data-collection devices. The University of Oregon Computer Center provided valuable assistance in developing a "clustering" method. Staff members of the Division of Vocational Education have given continuous guidance and cooperation throughout the study. Finally, our kindest appreciation is extended to our own secretarial staff for proofreading, tabulating and the many other facets of preparing this document.

We appreciate the opportunity to be of service to the Division of Vocational Education. If we can render any further assistance, please call on us.

Sincerely,
P B Jacobson
Paul B. Jacobson, Dean
School of Education

PBJ:aa

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*These tables are found in the back of this report in the form of large fold-outs.

CHAPTER I

INTRODUCTION AND SUMMARY

Introduction and Summary

Two factors, rising labor force and rapidly advancing technology, have combined to give increased importance to the problem of matching people to jobs. The problem is not a new one, but it is receiving increased attention, it has an urgency, and is more difficult in its solution now than in the past. This study is addressed to the implications of the problem for technical-vocational training in Oregon.

A rapid increase in the labor force is not a phenomenon peculiar to the 1960's. The waves of immigrants entering the United States in the first two decades of this century, relative to the population and labor force of that time, should have exerted greater pressure on the economy and society than the population explosion following World War II. The fact that it did not is a function of an open frontier and expanding labor requirement associated with land development, and a higher degree of social tolerance for high level unemployment. A further difference between the earlier period and the present is the much slower rate of technological development and generally lower level of skill required then than now.

Technological change has always required adjustment by both industry and labor to the demands of new machinery, new techniques, and new products. History is replete with examples of whole industries which have disappeared under the impetus of change, the classic example being those associated with a horse-powered economy replaced by the internal combustion engine. The declining demand for manpower in agriculture is a notable example of the changes wrought by technological development, and mining, especially coal mining, still another.

The changes in employment resulting from technological development have been quite successfully made in the past and most of them will be in the future. The decline in agriculture employment from 12-15 million to about 4 million in the last quarter century has not resulted in millions of unemployed farmers. Some of the displaced persons have retired or died, others have shifted to new employment, and a few have become unemployed or underemployed farm laborers. The same is true of coal miners and of many other occupations. A comparison of the number of persons employed in various occupations in 1950 with the number in the same categories in 1960 will reveal a surprising flexibility in the labor force, but to generalize and conclude that there is no problem of matching people to jobs is to overlook several features of the present-day economy and society which, upon examination, deny such a conclusion.

Past changes in industry, while they closed some avenues of employment, were not at the point of closing some of the last jobs available to unskilled or semiskilled labor. We are now faced to some extent by the cumulative effects of change so that there is very little need for low skilled labor and a much enlarged demand for higher skills, and each new technological development seems to add to the problem.

Social change has also been coupled to economic change in a way which bears heavily on the problem in a fashion not experienced in earlier decades. The emancipation of women, both economically and technologically, from many housekeeping chores has brought them into the labor force in larger numbers. The number of women in the national labor force increased between 1950 and 1960 by nearly 34 per cent, while the male labor force increased by less than 7 per cent.

Still another social revolution, increased political and economic stature for the nonwhite (largely Negro) part of our population, has yet to make its full impact felt, but it will no doubt complicate the problem further. When a large part of the labor force demands increased participation in the economy, it is as though new workers had been added to the labor force. Heretofore many Negroes were either underemployed, or not in the labor force at all, because of racial discrimination. How large an increase in labor force this new economic stature will bring no one can yet estimate, but it will surely be significant.

If all of the factors noted above were not sufficient to mark the present situation apart from previous years, still another would make it so. We live in a time of increased social conscience and increased awareness of social responsibility. For many reasons, too complex and varied to examine here, we have adopted as one of our goals the assurance that everyone has the best possible chance at personal development. We have thus chosen to supplement the workings of the labor market by programs designed to upgrade the labor force by training or retraining workers to take their place in a more highly technical economy.

In order to carry on a planned program of assistance to the manpower market, the national government has found it necessary to embark on a program of study of future development of the economy. The Departments of Commerce and Labor have been especially active in the economic studies program. Chapter VI of this report presents a partial bibliography of the work being done which has special reference to manpower problems.

Private industry has also become increasingly aware of a need to plan ahead in order to reap maximum advantage from technological change, and, in its personnel policy, to be sure it obtains the type of employee most likely to be adaptable to change. Hiring practices are therefore placing additional emphasis upon the long-run development of employees at all levels. Industry feels that they must hire in the prospect that the person will be on the payroll 10 years from now, and they want to be sure that he will be adaptable to the intervening change. This has brought increased emphasis on foresight and planning for which a prime requisite is more and better data about change and its impact on the firm.

Thus the needs of public agencies and private business merge, at least in the need for data upon which to base current and long-run decisions--industry to plan for its own development, and government in order to decide how and in what specific areas to give assistance.

An agency of government which is most directly concerned with training the labor force to fit the jobs in coming years is public education. This present research effort is directed at examining some of the ways of obtaining the data necessary for decisions on the kind of education which will best equip people for a job. Given the presumption that public education neither can nor should bear all the burden of training people for a job, where can educational efforts be directed in order to get maximum return? This question can in turn be resolved into many subsidiary questions of which only a few can be attacked in this study. The question of which occupations should be the subject of a specific training program can only be answered after we know how much money is available, how much the training program will cost, and what such training, offered at public cost, will add to the public benefit. A prior question, for which occupations should training be offered somewhere can be answerd somewhat more easily and immediately by reference to existing data or information to be accumulated. In many ways the latter question is the first needing an answer. In arriving at an answer we will also be satisfying indirectly the need of private industry for better data, so that the question of which occupations will increase and which decrease in the next few years should obviously receive a high priority.

The question is more easily stated than answered, and it does not lend itself to any simple or straightforward assault. The rise or decline of occupations is interwoven with change in industry and trade, which in turn is dependent on technological and social change resulting from a long history of development. In order to obtain good and trustworthy answers, the problem must be researched with care from many different angles using available data where possible, and adding to information by the best available research technique when that becomes necessary.

Three techniques are considered as potentially more or less useful for gathering data upon which to base decisions on technical-vocational education in Oregon. In each case they should be considered as supplemental to existing information and subordinate in the final analysis to informed judgement by educational administrators and an interested lay public. The three techniques form the various parts of the report which follows. Discussed briefly below, the three are (1) questionnaires, (2) projections by regression techniques, and (3) interindustry analysis and projection.

Questionnaires are a time-honored method of gathering data, and, in a sense, are the only way to do so. Any research technique relies either directly or indirectly upon questionnaires. If published data are used, the chances are very high that it has been accumulated by a questionnaire of some kind. In discussing its use for purposes noted here it is intended only to refer to its use either exclusively or as the major item among a variety of methods.

The reliance upon a set of questionnaires to gather most of the data for this particular need has several disadvantages, not least of which is that when we ask people (employers, employees) to tell how many will be employed in various occupations at some time in the future, we pose a very complicated question. It requires a thorough and discriminating knowledge of past trends in an occupation and some clear idea about future developments in the industry employing the people. The latter in turn requires information about developments in still other supplying and buying industries which would affect the one in question. It, in short, requires the respondent to know the very thing which can result only from analysis of the responses to questionnaires.

The Bureau of Labor Statistics has rejected this technique.

> The Bureau of Labor Statistics has not considered it useful to follow the approach of conducting surveys in which employers were asked how many workers they needed in the future. Few employers have made any careful study of this question, and replies tend to be perfunctory.[1]

The major advantage of a direct questionnaire is that it leaves the researcher in the position of simply reporting what he finds. If the question is reasonably clear and the response seems adequate, the only task remaining is to tabulate the answers into appropriate categories and cross-classifications. The trouble arises in the fact that, while the respondents might do the best they could to answer the questions, the answers would not represent anything upon which significant conclusions could be based. The tabulation becomes only an opinion poll of what the respondents happened to report at the moment.

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[1] Introductory Statement On the B.L.S. Program, Harold Goldstein in Long Term Manpower Projections, edited by R.A. Gordon, Institute of Industrial Relations, University of California at Berkeley, 1965, p. 6.

As noted above, the use of questionnaires or interview schedules is a necessary technique in nearly every research study, and in a study of vocational training needs some questionnaires could be used, but only to clarify certain technical problems or to gather historical data for projection purposes.

In Chapter II below there are presented sets of questionnaires for development of data related to occupations and vocational education and training in Oregon. Included with the questionnaires is a manual of directions for their use.

The second technique for determining occupational group size in the future involves the use of statistical techniques to project known data and discernible trends. As with questionnaires, this method is also well known and often employed. Coupled with questionnaires to supplement existing data, and with careful analysis guided by knowledge of the economy in question, it can be a very useful and productive method of investigation.

Chapter III of this report consists of a group of eight tables of data on occupational groups which are the result of one projection of census data for Oregon. Included with the tables is an explanation of their derivation and suggestions as to how the same method can be used for further work along the same lines. The projections presented in this report are not intended to be taken as definitive. They are illustrative of a technique which if employed in more detail will provide more information more expeditiously and cheaply than the exclusive use of questionnaires. If projection of existing data is used, it is recommended that it be coupled with a highly selective and concise questionnaire to add to existing data, but only as gaps in data become clearly identified and could only be filled by questionnaires.

There are several important advantages in using projection techniques, not least of which is that it is more economical of both time and money because it builds upon a significant accumulation of raw data by other agencies. The United States Bureau of the Census, the United States Department of Labor, and the Oregon Department of Employment have already spent large sums of money and considerable time in building data on population and the labor force of Oregon. This data can be taken as a point of departure for further analysis in the use of a projection technique.

A further advantage of projection lies in its almost automatic inclusion of trends. One of the more troublesome problems involved in determining future needs for many occupational groups is the changing capital-labor mix due to advancing productivity of industry in general. Several methods of attacking this problem are available, and none of them is completely satisfactory, but the problem is certainly handled more easily and satisfactorily in projection than in the use of questionnaires. The change in employment of farm labor between 1950 and 1960, for example, is largely attributable to rising productivity of agriculture, which has resulted in greater output and a shift of capital into the industry and labor out of it. Using data from the decennial censuses of population, monthly reports on labor force and population from the Bureau of Census, and year to year data from the Oregon Department of Employment permits the assessment of both occupational and industrial change in the state's economy, and a part of the change is clearly due to changing productivity. Additional data on changing productivity accumulated by the United States Department of Labor can be fed into the analysis to determine areas of rapid change in productivity and consequent adjustment of the projections to account for such development.

A third advantage of using a projection technique is that it closely relates local analysis to work going on at the national level. It would permit continual appraisal and updating of the results in the light of frequent reports from the national program.[2] Not only would it be possible to adapt some of the national data to the local situation, but possibly some benefit would be derived from avoiding problems encountered elsewhere. It would thus be possible to build upon a significant body of information and technique already developed and available.

The third and last technique to be discussed here is less widely known and has only within the last 3-4 years begun to be used in connection with manpower problems. It is called interindustry analysis or sometimes more specifically input/output analysis. Its development and use are discussed more fully in Chapter IV of this report, and the only comments at this point are upon its use in comparison to the other two techniques already discussed.

The primary advantage of the use of input/output is that it is designed specifically to deal with a very troublesome problem--tracing the effects upon one industry resulting from change in another. It will thus permit a more accurate and meaningful analysis of changing labor requirements in any given industry because it identifies the interrelationship between the given industry and the rest of the economy. Presenting its basic data in matrix form, input/output analysis first lists (i.e., by rows) all the outputs of each industry including those parts sold to other industries, governments, investment uses, export, and to consumers. The other direction of the matrix (i.e., by columns) thus lists all inputs of each industry from all others--i.e., all the materials, services, and labor necessary to produce its output.

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[2] Jack Alterman, "The Federal Government's Program of Economic Growth Studies," Bureau of Labor Statistics, U.S. Department of Labor, 1965, mimeographed, 12 pp.

Listed first as dollar amounts, the entries in each cell of the matrix are then converted to a set of coefficients by which we can see how much per dollar (per cent) of an industry's output depends upon each other industry for input. By a rather complicated mathematical process, which is explained below in Chapter IV, the technical coefficients are converted to an inverse-coefficient table to show both direct and indirect effects upon any given industry of the complex of demands made upon it by other industries and, in turn, its demands upon others.

The final step of interest to a study of manpower problems is to convert the dollar figures to labor coefficients, thereby expressing the interindustry relations in terms of people required to produce the goods and services.

The use of an input/output study similar to the one outlined in Chapter IV would not produce immediate answers to all the questions posed by a study of manpower development in the state. Its advantage lies not in speed or ease of use but rather in much improved and more reliable information. It deals directly and efficiently with the most vexing problems of such a study and, in addition, could draw heavily upon national studies of similar nature for guidance in technique and data.

An input/output study of Oregon's economy has an additional advantage in that it produces the sort of information which can be used by many agencies and private business firms. In the process of gathering data for an input/output study for manpower purposes, data will inevitably be collected and analyzed which will be of use to state and local governments, planning agencies, individual business firms, and many other units and groups of the society and economy.

It can be seen from the discussion above and from the material which follows in this report that analysis of the problems of manpower allocation in an advanced economy is a highly complex matter. No simple or straightforward single technique is available, and a combination of methods of analysis is required. Three methods have been discussed briefly in this chapter, and each one constitutes a subsequent chapter in the report. Each method has its advantages and disadvantages, but in general the results will be found to be more reliable with a more sophisticated technique; thus, input/output analysis in this case promises the better results.

The use of questionnaires as the primary emphasis of a study of manpower problems does not promise reliable results. On the other hand either projection or input/output analysis would have to rely to some extent upon questionnaires even if somewhat different in aim from the ones offered herein.

Projection also has a role to play in either input/output analysis or the use of questionnaires. The development of basic assumptions about such things as population, population characteristics, labor force, and labor force participation rates must involve analysis and projection of the existing data. These projections then become part of further analysis, such as the input/output type.

CHAPTER II

DATA COLLECTION DEVICES AND THEIR USE

A GUIDE TO DATA COLLECTION

Some of the problems of using the data-collection devices attached to this report can be foreseen in advance. The more obvious problems are discussed briefly here by way of general instructions. These instructions will aid initial phases of use of the instruments, but the solution of detailed technical problems will have to be left to the field personnel.

The interviewers and related staff should become familiar with the economic base of the state, especially the area to be surveyed. An examination of the reports from the Oregon Department of Employment regional labor office for the study area would be most desirable. A perusal of several recent monthly labor force reports from one of these offices should be made before collecting data and must be done before any interviewing.

Each person using the instruments should also be familiar with the Dictionary of Occupational Titles -- preferably the new edition (1965) if available -- and with the Standard Industrial Classification Manual. Familiarity with these two documents will ease the problem of classifying both jobs and firms because the field personnel will need to do most of the classification if any degree of standardization is to be obtained. In any case, the field personnel must be encouraged to record as much detail as possible in order to be able to classify firms and jobs accurately.

Interviewees should be contacted in advance of the meeting to insure cooperation. Contacts with the local Chamber of Commerce or a service club might assist in interpreting and clarifying the significance of this study. Advance publicity for the data collection would certainly increase the response by several percentage points.

Data-collection devices directed to school "dropouts" and unemployed persons will not likely be returned in any great number. Because they will have to be followed in most cases by an interview, the "dropout" device should be used entirely as an interview guide, and the same course of action may have to be followed with the unemployed.

A list of "dropouts" should be obtainable from the local high school, but the address will not be reliable if it is more than a few months old. The only way to locate these individuals will be through relatives or possibly through forwarding addresses left with the local post office. The probability is that very few can be located without incurring high expense.

The "dropout" population in Oregon is about 45-50 thousand. This is based on interpolations from national figures which show that there were 5,100,000 dropouts (age: 16-24) in the United States in 1964.[1] Because Oregon has a slightly higher than average educational attainment level, Oregon probably has less than the usual one percent.

A list of the unemployed can be obtained at the local office of the Oregon Department of Employment. However, many unemployed do not use these facilities. This fact is especially true for the more highly trained people who rely on personal effort to get a job. In spite of this problem no other source for a listing of the unemployed is available. Much of this problem could be avoided by the use of a household-type survey which would obviate the necessity of tracing certain persons.

There have been about 35-40 thousand unemployed persons in the state in recent years (1963-65) so that some sample will have to be devised to lessen the task, but even a 10 percent sample (3,000-4,000), which is very small, presents formidable interviewing problems. If data-collection devices are to be mailed, three times the sampling desired should be included to insure an adequate return; even then a large part of the responses may have to be obtained only after interview follow-up.

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[1] Bogan, Forrest. "Employment of High School Graduates and Dropouts in 1964," Monthly Labor Review (June, 1965), pp.637-643.

The exact size and characteristics of any sample are impossible to delineate without knowing the specifications of the universe to be sampled. The size of sample to be used with each of the questionnaires included in this report is impossible to specify until the geographical size of the area has been determined. If any particular instrument is considered for use at the statewide level, reliable results with a smaller percent (but a larger absolute number) of the total would be possible. As the size of the area to be sampled is reduced, the possibilities of generalization are also diminished. When the area under investigation becomes as small as a school district, a city, or even a county, the sample size would have to increase sharply if it is expected to be used for extensive generalization.

The problem of data gathering in Oregon is somewhat complicated by the small size of the typical firm in the state. There are very few large employers in Oregon. Such employers are heavily concentrated in Portland and its suburbs. In order to sample enough firms to cover half ofthe employees in an area it will be necessary to collect data from the majority of the firms in the area. Thus, for example, there were 117 firms with an average 478 employees in contract construction in Klamath County in the fourth quarter of 1964. The average employment was four employees, and the probability is that all or most of the 117 firms would have to be included in order to get sufficient and reliable responses to represent the majority of employees in the industry in the area. This is not an extreme example because if the choice had been one of the more populated counties (e.g., Lane, Multnomah) for retail and wholesale trade the problem would be still more complicated.

Identification of the firms to be included in the sample will depend on obtaining a reliable list of the existing business units. Several sources of such a list are available, but each has some problem connected with it. The Oregon Department of Employment has a list of all employers covered by the Unemployment Compensation Law. This list is not complete because some firms such as railroads and agriculture are not covered. The same difficulty is encountered with self-employed people, professional workers and domestics. For some purposes these omissions would not be serious, and this shortcoming would be offset by the reliability of the list and its inclusion of nearly all large employers outside of railroad transportation. A sample drawn from this list would show a smaller decline in employment in Oregon because the significant omissions are industries with declining employment -- e.g., agriculture and railroads.

Another possible source for a list would be the Oregon State Tax Commission. An area list of firms which file tax returns would be more complete than the Unemployment Compensation listing. This possibility is contingent on the legality of the State Tax Commission releasing such a list. One difficulty with this listing is that it does not distinguish the one-person type of firm from employers of several people. This method would present problems when attempting to stratify the sample.

The telephone book yellow pages are not reliable since they do not identify firms by size of employment nor by type of industry. What is more serious is the fact that the source would not distinguish between firm and plant. One employer may have several telephone listings because of multiple plant operation.

In summary, the best source of a list of employers, in spite of the shortcomings mentioned above, is the list from the State Department of Employment.

Another serious difficulty in measuring economic activity in Oregon is the rather extreme seasonal change in employment. Two alternatives are available. The first method is to take data for the month of April as representative of the annual average. The second method is to obtain employment data for each month and convert these figures to a simple annual average. This latter method is difficult and time-consuming,since it involves a search of employer records not usually designed to produce this kind of data easily. Yet, if resources are available, the second method is the more reliable.

However, data for the month of April is more readily comparable to already existing information such as the decennial census. It is, of course, easier to secure information for one point in time than for several months. For these reasons the April data would seem to be preferable.

Another constraint brought **upon** the use of questionnaires and interviews by the reliance upon the April data is that all data must either be gathered in April or deseasonalized. Serious problems of comparability would be introduced into the data if several areas of the state were to gather figures at different times as though they were representative of the annual average. Because different industries are subject to different seasonal influences, it is necessary to use data for each month for several consecutive years from which seasonal indexes can be constructed. Well-known statistical techniques can be applied to refine the data from several industries in several areas to make one set comparable to another. Oregon employment data has not been extensively deseasonalized.

Another problem which arises,especially in a survey of the Portland area and to a lesser degree in other metropolitan areas,is the identification of commuters. This is especially critical in the case of Portland, where a substantial number of people live in Clark County, Washington, but work in Portland or vice-versa. A similar problem exists in such cities as Salem and Corvallis, which are close to county boundaries. This problem is present only when gathering establishment data and is avoided altogether in household statistics. The only possible adjustment is through careful identification of the residence of all respondents and the adjustment of the statistics for this factor where it is appropriate.

The existence of both household and establishment data for what purports to be the same category can be misleading. Care must always be exercised to compare data gathered in the same manner. Major discrepancies and considerable confusion can arise in trying to reconcile data secured from employer questionnaires with information arising from the U. S. Census which is household type. The former will report the number of jobs while the latter reports job holders, and the difference is that some people hold two or more jobs while others are part-time workers and are missed altogether in employer responses. As a general rule, household-type data is more accurate and complete in counting people in occupations and in the analysis of their characteristics.

Probably the point of greatest difficulty in all of the data collection will be to obtain any reliable information of future developments. Employers are not accustomed to planning ahead for manpower needs, and questions about the future will elicit only perfunctory response or none at all. If employers have any concrete plans for changing existing products or developing new ones, they will likely not reveal them. Interviewers should be cautioned not to press questions about new products or processes too far because of the risk of disturbing respondents to the point that it could prevent obtaining other data.

MANUAL OF INSTRUCTIONS FOR DATA-COLLECTING DEVICES

A questionnaire is a measuring instrument. The reason for its use in preference to guesses or judgments based on unaided observation is that questionnaires like other measuring instruments are more accurate than the naked eye alone. Since accuracy is a fundamental reason for the employment of a questionnaire, the user should exercise care in its administration to assure the most accurate results.

Arrangements for Administration

Freedom from distractions is one of the first considerations in seeking a space for test administration. If examinees are to be free to concentrate on the instrument, they must not be disturbed by people, incidents or noises which distract their attention from the task at hand. Some people are able to perform satisfactorily in a distracting environment. However, the proctor should not assume that every subject is properly motivated, and he must take whatever precautions he can to insure freedom from distractions. Specific recommendations for each group are provided in a later section of this manual.

Good working space for the examinee is a second consideration. This implies that each respondent should have the use of a flat, horizontal surface on which to mark his responses.

Advance preparation of materials insures having everything needed during the testing, reduces the time needed for administration, and results in better morale among the respondents.

Adequate proctoring is also a prerequisite for good testing. Since these instruments are largely attitudinal, proper staging is essential in order to attain maximum results. Respondents must know the purpose of the instrument and must be encouraged to exercise care in making their judgments. Proctors may assist in the interpretation of items within the device, but should refrain from biasing the examinee's response. Generally one proctor is desirable for each 20-25 examinees. Proctors should be familiar with the Manual of Directions as well as the instrument itself. The proctor should carefully examine each item of the device prior to the session.

Make clear to examinees why they are being asked to respond to the instrument, how the results will affect them and future programming in vocational education, and let them know the approximate time requirements. If the examinee is really motivated to the point where he believes that his responses will help him, his children and others, he is more likely to exercise care in selecting appropriate responses.

The Preliminaries

The review of all arrangements is naturally the first preliminary to the start of the questionnaire period. The entire process of data collection seems so very simple to the average respondent that its smooth progress is important to establishment of rapport.

The motivating talk follows immediately after the arrival and seating of the examinees. The talk should be brief and to the point. The examiner or proctor should inform the respondent that this device is designed to collect information regarding voational education programs and how they might become more closely related to the world of work. The objective is to set the stage for the process by giving the subject some idea of what he is going to do and how long it will take him, and to make him want to portray himself accurately on the tests by relating his true beliefs. Most respondents will be interested in improving their school system and thus derive greater returns from their investment in education whether they be a taxpayer or a student. Most will realize that there is always a gap between school program and student needs. Since the aim of this entire project is to close this gap, tell them so. However, do not attempt to change their attitudes inasmuch as this stage-setting has been for motivational purposes only.

The Directions supplied on each device should be reviewed with the examinees. Generally, they should be adequate for the respondent group. Any supplementation to the prescribed directions should be given with care so that the examinee is not influenced.

The anonymity of the respondent should be assured since the questionnaires are attitudinal and identification of individual respondents has no bearing on the purpose of the instrument. Given assurance that what they may say cannot create difficulties, students, teachers, and employees are more likely to express their views on certain elements of the questionnaire.

Specific Administration Procedures

After the proctor has carefully reviewed the directions in the preceding sections, he should review the directions that are pertinent to the administration of the instrument to this specific group. The purpose of these instructions is to develop equivalent situations between similar groups in order to improve reliability.

The Student Survey

The student data-collection device is to be administered in compliance with the general instructions cited on the preceding pages. This device is directed to students in Grades 10-12 and should be proctored in the manner previously described.

The Dropout Survey

It is recommended that the dropout data be collected in an interview situation. Care should be exercised in the selection of interviewers. The State Department of Education should be responsible for developing a training program for these field workers. Merton[1] describes the steps involved in preparing for the focused interview on vocational education.

It is especially important that the interviewer establish rapport in the early phases of the interview. Any unusual problems encountered in the process should be noted by the interviewer after termination of the session.

The School Personnel Survey

This device is to be administered in compliance with the recommendations listed on the preceding pages. The device is directed to certified personnel in public schools enrolling students in Grades 9-12 or Grades 10-12. Since it is directed to "Administrators only," the last page may be removed when seeking information from teacher groups. The administrator's section of this instrument may also be used in surveying administrators of private training programs.

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[1] Merton, Robert; Fiske, Marjorie; Kendall, Patricia, The Focused Interview (Glencoe: The Free Press), 1956.

The Employer Survey

The device is to be administered in an interview situation. The interviewer should contact the employer in advance to explain the purpose and objective of the study. At that time he should request an appointment to meet with the firm's representative who will furnish the data. If the firm has a diversified group of employees, he will likely arrange to pick up the response at a later date because of the complexity of completing the occupation-skill matrix. The validity of this particular section will be directly dependent on the thoroughness and care exercised by the respondent.

The Employee Survey

At the time that the interviewer is contacting the firm regarding the Employer device, he should also seek to gain the cooperation of the employer in administering the Employee device. It is strongly recommended that this device be administered on a group basis by a trained examiner. It would be hoped that the instrument could be completed during a time when both employer and employee can share in the time involved, e.g., extended coffee break, extended lunch hour. Some employers may be able to grant company time to furnish the necessary information. The occupation-skill matrix should be completed by each employee as he perceives the elements of his present job.

Guide to Tabulating Questionnaires

All of the responses to the instruments have been designed to be placed on computer cards. The item number(s) at the left of the page corresponds with the card column(s) of the input data card. Responses to each single digit item, therefore, will be represented by a single digit.

Some write-in questions appear in the battery. A coding system has been developed and is included in the appropriate section of this division of the Manual of Instructions. In this manner, write-in responses can be converted to numerical representation.

The Student Survey

The first four (1-4) item numbers have been reserved for county and school district identification. Counties may be arranged in alphabetical order and numbered from 01-36. School districts within counties may be arranged alphabetically and numbered from 01-"N", where "N" represents the number of school districts in the county.

Information from items 7-9 is to be translated to a number code using the Directory of Post Offices published by the Post Office Department of the United States in Washington, D.C. A copy of the information needed for developing such a coding system may be found in the Oregon Blue Book.[2]

Information from items 15-17, 19-21, 22-24, and 25-27 should be translated to the appropriate first three digits of occupations as listed in the Dictionary of Occupational Titles.[3] After "clusters" are developed, translation to a "cluster" code representation would be desirable.

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[2] Secretary of State, Oregon Blue Book, 1965-66 (Salem: Secretary of State), 1965. pp. 293-96.

[3] United States Employment Service, The New Dictionary of Occupational Titles (Washington: U.S. Government Printing Office), 1949.

The information to be included in card column #32-34 will be developed by using a coding system based upon the publication *List of Public and Private Schools Offering Post-High School Technical and Vocational Training Opportunities in Oregon.* [4] The code will be developed by numbering the schools from 1-"N" starting at the beginning and working to the end. The entry space for "city" is for clarification space and need not be coded.

Item 57 invites a student response. Such additional responses can be utilized to lengthen this section of the device when the final draft is prepared.

The Dropout Survey

The first four(1-4) item numbers have been reserved for county and school district identification. Counties may be arranged in alphabetical order and numbered from 01-36. School districts within counties may be arranged alphabetically and numbered from 01-"N", where "N" represents the number of school districts in the county.

Information from items 7-9 is to be translated to a number code using the *Directory of Post Offices* published by the Post Office Department of the United States in Washington, D.C. A copy of the information needed for developing such a coding system may be found in the *Oregon Blue Book.*[5]

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[4] Department of Education, *List of Public and Private Schools Offering Post-High School Technical and Vocational Training Opportunities in Oregon* (Salem: Department of Education), 40 pp.

[5] Secretary of State, loc. cit.

Information from items 17 and 28 shall be translated to the following code:

1 = Agricultural Education
2 = Business and Office Education
3 = Distributive Education
4 = Homemaking Education
5 = Trade and Industrial Education
6 = None of these

Information from items 21-23, 30-32, and 33-35 shall be translated to the appropriate first three digits of occupations as listed in the *Dictionary of Occupational Titles*.[6] After "clusters" are developed, translation to a "cluster" code representation would be desirable.

Item 56 invites a response from the dropout. Such additional responses can be utilized to lengthen this section of the device when the final draft is prepared.

The Employer Survey

The first four (1-4) item numbers have been reserved for county and school district identification. Counties may be arranged in alphabetical order and numbered from 01-36. School districts within counties may be arranged alphabetically and numbered from 01-"n", where "n" represents the number of school districts in the county.

Information from items 5-8 is to be translated to a number code formulated from the *Standard Industrial Classification Manual*.[7]

Information from items 9-11 is to be translated to a number code developed from the *Directory of Post Offices* published by the Post Office

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[6] United States Employment Service, loc. cit.

[7] Office of Statistical Standards, *Standard Industrial Classification Manual* (Washington: U.S. Government Printing Office), 1957.

Department of the United States in Washington, D.C. A copy of the information needed for developing such a coding system may be found in the Oregon Blue Book.[8]

All of the occupations cited by the employer in the occupation-skill matrix shall be translated to the appropriate first three digits of occupations as listed in the Dictionary of Occupational Titles.[9]

The Employee Survey

The first four (1-4) item numbers have been reserved for county and school district identification. Counties may be arranged in alphabetical order and numbered from 01-36. School districts within counties may be arranged alphabetically and numbered from 01-"N", where "N" represents the number of school districts in the county.

Information from items 7-9 is to be translated to a number code developed from the Directory of Post Offices published by the Post Office Department of the United States in Washington, D.C. A copy of the information needed for developing such a coding system may be found in the Oregon Blue Book.[10]

Information from items 12-14, 17-19, 22-24, 27-29, 32-34, 37-39, 42-44,47-49, and 52-54 as well as the occupation of the employee respondent to the occupation-skill matrix shall be translated to the appropriate first three digits of occupations as listed in the Dictionary of Occupational Titles.[11]

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[8] Secretary of State, loc. cit.

[9] United States Employment Service, loc. cit.

[10] Secretary of State, loc. cit.

[11] United States Employment Service, loc. cit.

The School Personnel Survey

The first four (1-4) item numbers have been reserved for county and school district identification. Counties may be arranged in alphabetical order and numbered from 01-36. School districts within counties may be arranged alphabetically and numbered from 01-"N", where "N" represents the number of school districts in the county.

Information from items 10-12 shall be translated to the appropriate first three digits of occupations as listed in the *Dictionary of Occupational Titles*.[12]

Some Possible Uses of Survey Data

The purpose of this section of the manual is to suggest some possible uses of the information secured from the data-gathering devices. The uses suggested are by no means complete nor should they influence the administrator of the devices in the possibilities for analysis use.

The Student Survey

A comparison between the following items in the high school student data-gathering device should reveal some significant relationships:

Grade average (11)	and	Course pursued (12)
Grade average (11)	and	Occupational preference (22-24)
Grade average (11)	and	Training anticipated (31)
Grade average (11)	and	Mobility--occupational (28), and geographic (38-39)
Grade average (11)	and	Occupational information (42)
Course track (12)	and	Occupational preference (22-24)
Course track (12)	and	Appraisal of curriculum (29)
Course track (12)	and	Occupational information (42)

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[12] United States Employment Service, loc. cit.

Occupational preference (22-24)	and	Mobility--occupational (28), and geographic (38-39)
Occupational preference (22-24)	and	Training anticipated (31)
Occupational preference (22-24)	and	Work experience (15-17, 19-21)
Occupational preference (22-24)	and	Residence location (35)
Residence location (35)	and	Mobility--occupational (28), and geographic (38-39)

The Dropout Survey

An examination of the following items may reveal some useful relationships:

Curricular satisfaction (14)	and	Training pursued (18)
Vocational preparation pursued (21-23)	and	Training desired (17)
Vocational preparation pursued (21-23)	and	Occupational preference (30-32)
Occupational preference (30-32)	and	Mobility--occupational (36), and geographic (40)

The Employee Survey

The relationship of the following items may be examined:

Education completed (10)	and	Job satisfaction (scale score can be developed from responses to 69-77)
Occupation (12-14)	and	Job satisfaction (scale score can be developed from responses to 69-77)
Duration of employment (15)	and	Job satisfaction (scale score can be developed from responses to 69-77)
Training appropriateness (scale score can be developed from responses on 56, 58, and 60)	and	Job satisfaction (scale score can be developed from responses to 69-77)
General satisfaction (78)	and	Job satisfaction (scale score can be developed from responses to 69-77)

The last relationship may be used to determine the reliability of the job satisfaction scale as developed from items 69-77.

The Employer Survey

The relationship of the following items may be examined:

Skills and knowledge preparation, Business and Office--composite scale score developed from 15, 19, 23, 27, 31, 35, 39, 43, and 47	and	Employer satisfaction (68-69)
Skills and knowledge preparation, Trade and Industry--composite scale score developed from 16, 20, 24, 28, 32, 36, 40, 44, and 48	and	Employer satisfaction (68-69)
Skills and knowledge preparation, Agriculture--composite scale score developed from 17, 21, 25, 29, 33, 37, 41, 45, and 49	and	Employer satisfaction (68-69)
Skills and knowledge preparation, Sales and Distribution--composite scale score developed from 18, 22, 26, 30, 34, 38, 42, 46, and 50	and	Employer satisfaction (68-69)
Relations with others, Business and Office--composite scale score developed from 51, 55, 57, and 63	and	Employer satisfaction (68-69)
Relations with others, Trade and Industry--composite scale score developed from 52, 56, 60, and 64	and	Employer satisfaction (68-69)
Relations with others, Agriculture--composite scale score developed from 53, 57, 61, and 65	and	Employer satisfaction (68-69)
Relations with others, Sales and Distribution--composite scale score developed from 54, 58, 62, and 66	and	Employer satisfaction (68-69)

The School Personnel Survey

A comparison between the following items may reveal some significant relationships:

Work experience (10-12)	and	Major teaching assignment (15-16)
Work experience (10-12)	and	Vocational attitude(34)
Broad assignment (13)	and	Curricular content (19)
Broad assignment (13)	and	Vocational class standards (21)
Broad assignment (13)	and	Student need satisfaction (23)
Broad assignment (13)	and	Post-high school training (24)
Broad assignment (13)	and	Vocational training (37)

This brief explanation has not attempted to exhaust all of the possible uses of the data collected with the devices. Similar analyses should be made by making comparisons between employer and employee and school personnel and the high school student.

Data-Collection Device (4A and 7B)

HIGH SCHOOL STUDENT

INSTRUCTIONS

Read the question carefully. Select the correct or most appropriate answer. Record the number beside your answer in the space provided in the left margin of the page.

Example:

2 1. In which state is the city of Portland located?

1) California
2) Oregon
3) Idaho
4) Washington

On some questions you will be asked to write out your answer.

Begin with Number 5 on the next page. There are no Numbers 1 through 4.

DATA-COLLECTION DEVICE (HIGH SCHOOL STUDENT)

Items 1 through 4 to be used to identify county and school district.

___ 5. What is your age?

1) 13
2) 14
3) 15
4) 16
5) 17
6) 18
7) 19 or older

___ 6. What is your sex?

1) Boy
2) Girl

___ 7-9. What is your Post Office address? (Indicate the community only. Do not include house and **street number.**)

____

___ 10. What is your grade in school?

1) 9
2) 10
3) 11
4) 12

___ 11. What is your grade average?

1) Near an "A" average
2) Near a "B" average
3) Near a "C" average
4) Below a "C" average

___ 12. Most of your high school courses will be closely related to one of the following areas. Which one?

1) Vocational education including agriculture, trade and industrial programs, business and office, distributive education, and home economics courses
2) General education
3) College preparatory
4) Don't know
5) Other

___ 13. Do you now have an after-school job (not including home chores) for pay?

1) Yes
2) No

____ 14. If answer to question number 13 is "yes," is the job

1) Part-time 2) Full-time

____15-17. If answer to question number 13 is "yes," what is the nature of your job? What specifically do you do? (Write in)

____

____

____ 18. Did you work last summer? (Mark one answer only.)

1) Yes - full-time all or most of the summer
2) Yes - full-time part of the summer
3) Yes - part-time all or most of the summer
4) Yes - part-time part of the summer
5) No - could not find any job
6) No - could not find a satisfactory job

____19-21. If answer to question number 18 was "1, 2, 3, or 4," describe your job on the following two lines.

____

____

What is your present occupational choice? (What kind of work would you like most to do? Keep in mind both your interests and what you believe your abilities to be.)

____22-24. First choice (write in)____________________________

____25-27. Second choice (write in)____________________________

____ 28. As new opportunities for work become available, would you be willing to change your present choice of occupation?

1) Would change 2) Don't know 3) Would not change

____ 29. Do you believe your high school experiences (course work and related activities) have prepared you for employment in your field of interest?

1) Believe they have 2) Don't know 3) Believe they have not

_____ 30. Who has been the strongest influence on your choice of occupation?

1) Family member
2) Relative not in immediate family
3) School counselor
4) School teacher
5) Friend your age
6) Adult acquaintance
7) Employer
8) Other

____ 31. How do you plan to prepare for your preferred occupation? (Choose one)

1) Attend a four-year college or university
2) Attend a two-year junior or community college
3) Attend a business college
4) Attend a specialty school, e.g., electronics, beautician, nursing, grocery checker, etc.
5) Enter military service
6) Enter apprenticeship training
7) Learn on the job
8) Don't know
9) Other

____32-34. If you are not going to a four-year college or university but do plan to continue your training after high school in a vocational school, a business school or a community college, which school do you plan to attend?

Name of school (write in)______________________________

City in which school is located (write in)_________________

____ 35. Where do you live?

1) In a town or city
2) On a farm of less than 10 acres
3) On a farm of 10 acres or more
4) In the country but not on a farm

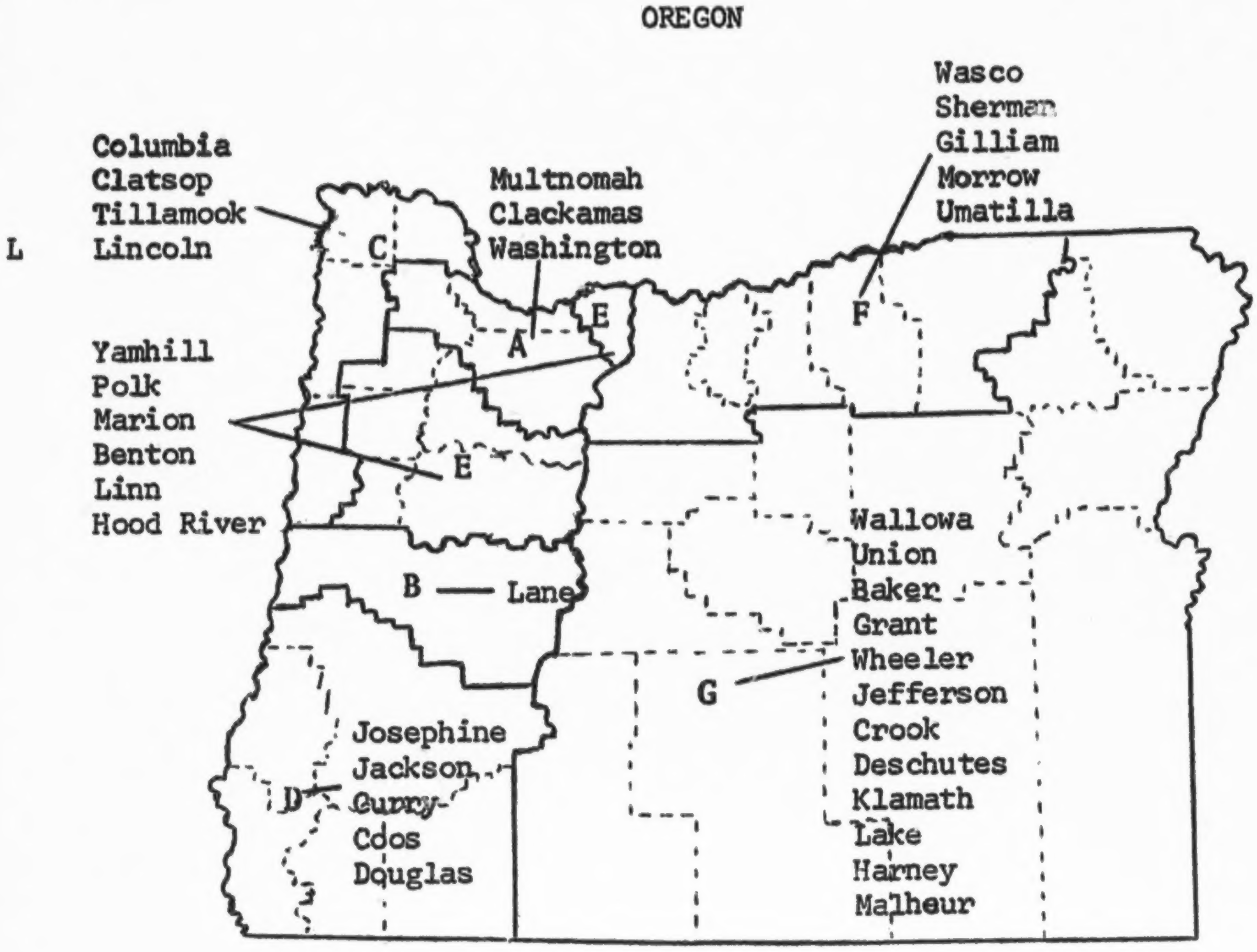
OREGON
L
Columbia
Clatsop
Tillamook
Lincoln
C
Multnomah
Clackamas
Washington
A
E
Wasco
Sherman
Gilliam
Morrow
Umatilla
F
Yamhill
Polk
Marion
Benton
Linn
Hood River
E
B — Lane
Wallowa
Union
Baker
Grant
Wheeler
Jefferson
Crook
Deschutes
Klamath
Lake
Harney
Malheur
G
Josephine
Jackson
Curry
Coos
Douglas
D

Figure I

Refer to Figure I for questions 36 and 37.

_____ 36. This figure divides Oregon's 36 counties into seven areas. In which area of the state do you live?

1) A
2) B
3) C
4) D
5) E
6) F
7) G

_____ 37. In which area of the state would you prefer to work?

1) A
2) B
3) C
4) D
5) E
6) F
7) G
8) None of the above -- prefer to work in another state

____ 38. If your first choice job is not available in the geographic area in which you want to live, would you

1) Move to where the job is available even it it is not where you want to live, or
2) Stay in the community or area in which you want to live and find a different and less desirable job.

____ 39. If the answer to question number 38 is "Move to where job is available . . .," how far would you be willing to move from your present residence in order to work at the kind of job that you want?

1) 0-25 miles
2) 26-50 miles
3) 51-100 miles
4) 101-200 miles
5) Willing to go wherever job is available

____ 40. How far would you be willing to travel each day (one way) from your place of residence to your place of work?

1) 0-10 miles
2) 11-20 miles
3) 21-30 miles
4) 31-40 miles
5) 41-50 miles
6) More than 50 miles

____ 41. How much time would you be willing to spend in travel each day (one way) from your place of residence to your place of work?

1) 0-10 minutes
2) 10-30 minutes
3) 30 minutes to an hour
4) More than an hour

NOTE: Boys only answer questions 42 through 44.

An apprenticeship program is one in which a young man, usually a high school graduate, is employed full-time while he attends class approximately two times a week for two hours each. Depending upon the trade or skill, the period of apprenticeship is ordinarily two to four years in length. At the end of the apprenticeship the worker is a registered journeyman (skilled worker) in his field.

____ 42. Do you believe you are informed about the Oregon State Apprenticeship Program?

1) Well informed about the program
2) Slightly informed
3) Know nothing about the program
4) Did not know the program existed

____ 43. If your answer to question number 42 was "well informed about the program" or "slightly informed," from whom did you learn about the apprenticeship program?

1) Family member
2) Relative not in immediate family
3) School counselor
4) School teacher
5) Friend your age
6) Adult acquaintance
7) Employer
8) Other

____ 44. Would you like to know more about the apprenticeship program?

1) Yes　　2) No

NOTE: All students answer remaining questions.

In terms of your future occupation, how important are the following things to you?

Answer in terms of:

1) Very important
2) Of some importance
3) Not important
4) Don't know

____ 45. Securing steady work

____ 46. Enjoying the work itself

____ 47. Earning large sums of money

____ 48. Having the opportunity to be original and creative

____ 49. Seeking advancement

____ 50. Helping others or aiding society

____ 51. Seeking a job with regular work hours

____ 52. Being independent, making own decisions and not having to rely on others

____ 53. Working with people rather than with things

____ 54. Being looked up to by the community

____ 55. Working with other people who do their jobs well

____ 56. Working under pleasant conditions (attractive surroundings, avoiding a place that is too hot, too dirty, too noisy, etc.)

____ 57. Other (specify) ____________________

Data-Collection Device (4A and 7B)

DROPOUT

INSTRUCTIONS

Read the question carefully. Select the correct or most appropriate answer. Record the number beside your answer in the space provided in the left margin of the page.

Example:

_2__ 1. In which state is the city of Portland located:

1) California	3) Idaho
2) Oregon	4) Washington

On some questions you will be asked to write out your answer.

Begin with Number 5 on the next page. There are no Numbers 1 through 4.

DATA-COLLECTION DEVICE (DROPOUTS)

Items 1 through 4 used to identify counties and school districts.

_____ 5. What is your age?

1) 16
2) 17
3) 18
4) 19
5) 20
6) 21
7) More than 21

_____ 6. What is your sex?

1) Male
2) Female

_____ 7-9. What is your Post Office address? (Indicate the community only. Do not include house and street number.)

____

_____ 10. What is the highest grade you completed in school?

1) Less than 8th grade
2) 8th grade
3) 9th grade
4) 10th grade
5) 11th grade

_____ 11. How long has it been since you left school?

1) Less than one year
2) One year
3) Two years
4) Three years
5) Four years
6) More than four years

This is a very important question for those who dropped out of school before graduation. There may have been several factors that influenced you to leave school, but will you indicate very frankly the two most important reasons why you left school?

_____ 12. Most important reason

_____ 13. Second most important reason

1) Lacked requirements to graduate
2) Could not see purpose in staying in school
3) Excessive absence
4) Married and/or pregnant
5) Had no friends in school
6) Didn't like the teachers
7) Personal or family financial reasons
8) Expelled from school
9) Other

_____ 14. Did your high school offer the vocational course you wanted to take?

1) Yes
2) No

____ 15. If the answer to number 14 was "Yes" did you get to take the vocational course you wanted?

1) Yes 2) No

____ 16. If you did not get to take the vocational course you wanted, what was the major reason you did not take the course?

1) Conflict in class schedule
2) Inadequate facilities and equipment
3) Didn't like the teacher
4) Classes too large
5) Too many other courses required -- did not have time for vocational courses
6) Advisor or counselor discouraged me
7) Parents discouraged me
8) Friends my age discouraged me

____ 17. If the answer to number 14 is "No" what course did you want to take that was not offered?

(Write in) ______________________________

____ 18. Have you enrolled in any occupational training program since you left high school?

1) Yes 2) No

____ 19. If the answer to number 18 is "Yes" where did you receive your occupational training?

1) Community college
2) Public vocational school
3) Private vocational school
4) Military service
5) Other

____ 20. Did you complete the occupational training program?

1) Yes 2) No

____ 21-23. Which occupation were you training for?

(Write in) ______________________________

____ 24. Have you ever had a full-time job since you left high school?

1) Yes 2) No

NOTE: If the answer to number 24 is "No" skip to number 31.

____ 25. How long after leaving high school did you get your first full-time job?

1) Less than one month
2) One to three months
3) Four to six months
4) Seven months to one year
5) More than one year

____ 26. How did you get your first full-time job after leaving high school?

1) By answering a want ad
2) Private employment agency (where you pay a fee)
3) Public employment agency (no fee required)
4) Help of friend or relative
5) Help of school teacher or counselor
6) Other

____ 27. Did any of your high school courses or experiences provide knowledge or skills you could use on your full-time job?

1) Yes 2) No

____ 28-29. If the answer to number 27 is "Yes" which school courses or experiences were most helpful?

(Write in) ______________________________________

____ 30. Why did you leave your first full-time job? (Select one)

1) Obtain a better job
2) Moved out of the area
3) Illness
4) Lay-off due to work slow down
5) Terminated by employer
6) Dissatisfied with pay scale, working conditions, etc.
7) Did not get along with employer or foreman
8) Other

What is your present occupational choice? (What kind of work would you like most to do? Keep in mind both your interests and what you believe your abilities to be.) Please be specific.

____ 31-33. First choice (Write in) ______________________________

____ 34-36. Second choice (Write in) ______________________________

____ 37. As various opportunities for work become available, would you be willing to modify or change your present choice of employment?

1) Would change
2) Don't know
3) Would not change

_____ 38. Where do you live?

1) In a town or city
2) In a suburb
3) On a farm of less than 10 acres
4) On a farm of 10 acres or more
5) In the country but not on a farm

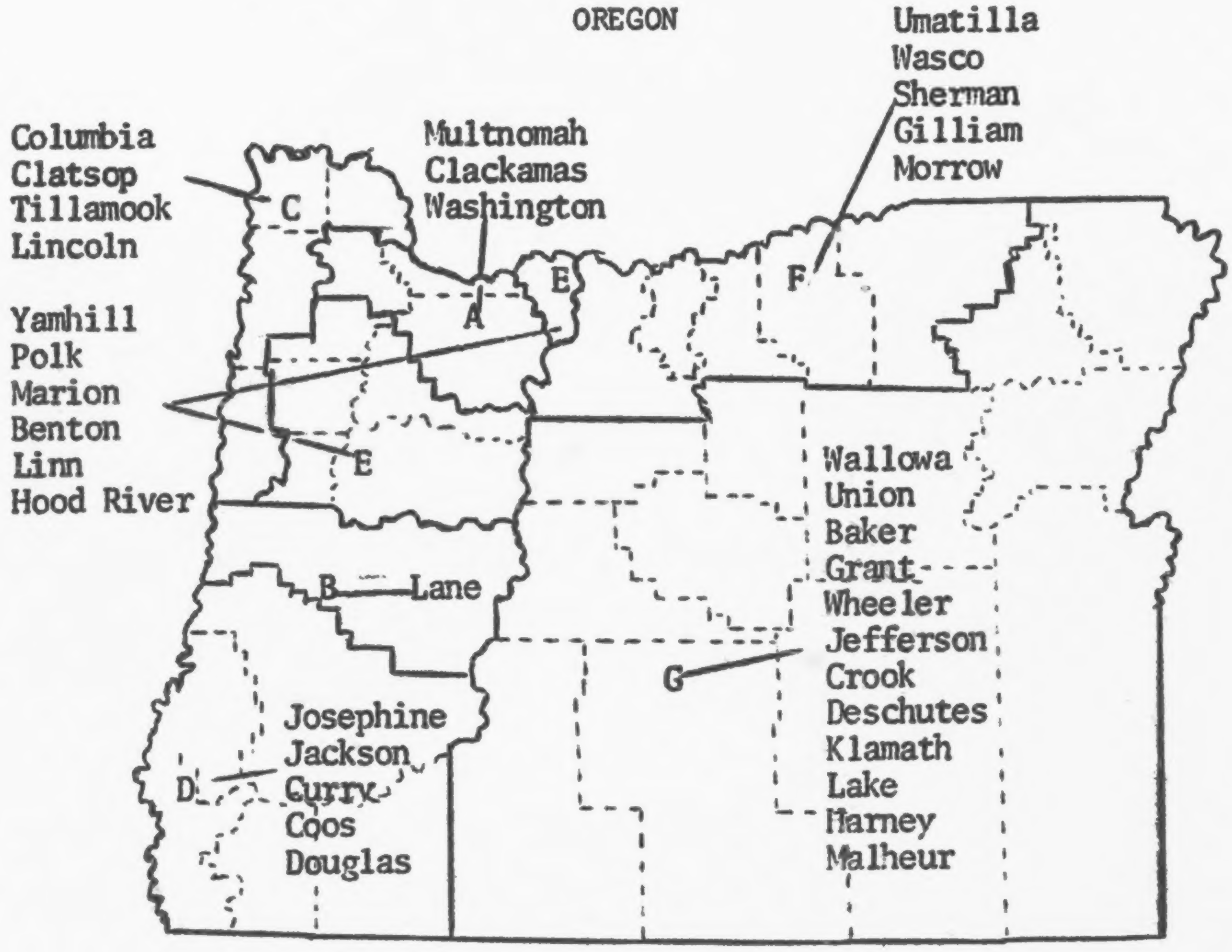
OREGON
Umatilla
Wasco
Sherman
Gilliam
Morrow
Columbia
Clatsop
Tillamook
Lincoln
Multnomah
Clackamas
Washington
C
A
E
F
Yamhill
Polk
Marion
Benton
Linn
Hood River
E
Wallowa
Union
Baker
Grant
Wheeler
Jefferson
Crook
Deschutes
Klamath
Lake
Harney
Malheur
B
Lane
G
Josephine
Jackson
Curry
Coos
Douglas
D

Figure I

Refer to Figure I for questions 39 and 40.

_____ 39. This figure divides Oregon's 36 counties into seven areas. In which area of the state do you live?

1) A
2) B
3) C
4) D
5) E
6) F
7) G

_____ 40. In which area of the state would you prefer to work?

1) A
2) B
3) C
4) D
5) E
6) F
7) G
8) None of the above prefer to work in another state

______ 41. If your first choice job is not available in the geographic area in which you want to live would you

1) Move to where the job is available even if it is not where you want to live, or
2) Stay in the community or area in which you want to live and find a different and less desirable job.

______ 42. If answer to question number 41 is "Move to where job is available . . ." how far would you be willing to move from your present residence in order to work at the kind of job you want?

1) 0-25 miles
2) 26-50 miles
3) 51-100 miles
4) 101-200 miles
5) Willing to go wherever job is available

______ 43. How far would you be willing to travel each day (one way) from your place of residence to your place of work?

1) 0-10 miles
2) 11-20 miles
3) 21-30 miles
4) 31-40 miles
5) 41-50 miles
6) More than 50 miles

______ 44. How much time would you be willing to spend in travel each day (one way) from your place of residence to your place of work?

1) 0-10 minutes
2) 10-30 minutes
3) 30 minutes to an hour
4) More than an hour

With regard to your future occupation, how important are the following things to you?

Answer in terms of:

1) Very important
2) Of some importance
3) Not important
4) Don't know

_____ 45. Securing steady work

_____ 46. Enjoying the work itself

_____ 47. Earning large sums of money

_____ 48. Having the opportunity to be original and creative

_____ 49. Seeking advancement

_____ 50. Helping others or aiding society

_____ 51. Seeking a job with regular work hours

_____ 52. Being independent, making own decisions and not having to rely on others

_____ 53. Working with people rather than with things

_____ 54. Being looked up to by the community

_____ 55. Working with other people who do their jobs well

_____ 56. Working under pleasant conditions (attractive surroundings, avoiding a place that is too hot, too dirty, too noisy, etc.)

_____ 57. Other (specify) ______________________________

Data-Collection Device (5)

HIGH SCHOOL TEACHERS AND ADMINISTRATORS

INSTRUCTIONS

Read the question carefully. Select the correct or most appropriate answer. Record the number beside your answer in the space provided in the left margin of the page.

Example:

__2__ 1. In which state is the city of Portland located?

1) California	3) Idaho
2) Oregon	4) Washington

On some questions you will be asked to write out the answer.

Begin with Number 5 on the next page. There are no Numbers 1 through 4.

DATA-COLLECTION DEVICE
(HIGH SCHOOL TEACHERS AND ADMINISTRATORS)

Items 1 through 4 used to identify counties and school districts.

____ 5. Sex:

1) Male
2) Female

____ 6. Age:

1) 20-29
2) 30-39
3) 40-49
4) 50-59
5) 60 and over

____ 7. Your residence during the major portion of your adolescent life was in a:

1) Rural area
2) Town (1,000 - 10,000)
3) Town (10,000 - 30,000)
4) City (Over 30,000)

____ 8. Your length of experience in the field of education outside your present district is:

1) 0
2) 1-3
3) 4-5
4) 6-10
5) Over 10

____ 9. Your length of experience in the field of education in your present district including the current year is:

1) 1-3 years
2) 4-5 years
3) 6-10 years
4) Over 10 years

____ 10-12. Full-time work (other than public or private school employment) for more than twelve consecutive months. (Exclude armed forces.)

(Write in here) ________________________________

____ 13. Your major assignment is:

1) Academic teacher
2) Vocational teacher
3) Other teacher
4) Supervisor
5) Counselor
6) Administrator

____ 14. Your educational preparation:

1) Bachelor's degree
2) Working towards Master's degree
3) Master's degree
4) Working towards Doctorate
5) Doctorate

____ 15-16. Your major assignment is: (Non-teachers omit)

1) Agriculture
2) Art
3) Business Education
4) Distributive Education
5) Driver Education
6) Language Arts
7) Home Economics
8) Industrial Arts
9) Mathematics
10) Music
11) P. E. & Health
12) Science
13) Social Studies
14) Trade & Industrial Education

____ 17-18. Your undergraduate major is:

Use code above

____ 19. In your school, the high school curricula strongly favor the college-bound student.

1) Agree
2) Uncertain
3) Disagree

____ 20. Most of the students in your school consider the present vocational education curricula to be an important aspect of the school program.

1) Agree
2) Uncertain
3) Disagree

____ 21. In your school vocational classes are used as a "dumping ground."

1) Agree
2) Uncertain
3) Disagree

____ 22. How would you rate the scholastic ability of your student body in comparison to other high school student bodies?

1) Very high
2) Above average
3) Average
4) Below average
5) Very low
6) Don't know

____ 23. High schools are often accused of failing to meet the vocational and/or academic needs of all students. What percentage of students in your school fit this situation?

1) 10 percent or less
2) 25 percent
3) 50 percent
4) 75 percent
5) More than 75 percent
6) Don't know

____ 24. About what percentage of students in your high school should seek college or university education?

1) 10 percent or less
2) 25 percent
3) 50 percent
4) 75 percent
5) More than 75 percent
6) Don't know

_____ 25. In your school, college-bound students receive a disproportionate amount of guidance while vocationally oriented students are neglected.

1) Agree
2) Uncertain
3) Disagree

_____ 26. In your school, vocational courses are repetitious and offer no progressive challenges to the vocational student.

1) Agree
2) Uncertain
3) Disagree

_____ 27. Additional offerings or emphasis in vocational education would increase your school's holding power.

1) Agree
2) Uncertain
3) Disagree

_____ 28. The type of vocational education program offered should be coordinated with the kinds of industries represented in the school community.

1) Agree
2) Uncertain
3) Disagree

_____ 29. Your vocational curricula tends to change on the basis of changing manpower needs.

1) Always
2) Nearly always
3) Sometimes
4) Rarely
5) Never

_____ 30. Your school program is designed to satisfy the current and future manpower needs of your state.

1) Agree
2) Uncertain
3) Disagree

_____ 31. Your school enlists the aid of industry in formulating a vocational program.

1) Always
2) Nearly always
3) Sometimes
4) Rarely
5) Never
6) Don't know

_____ 32. About what percent of the graduates in your high school will have to leave your community in order to gain a satisfactory position?

1) 10 percent or less
2) 25 percent
3) 50 percent
4) 75 percent
5) More than 75 percent
6) Don't know

_____ 33. What do you feel is the greatest deterrent to expansion of vocational education in your school?

1) Facilities
2) Operating revenues
3) Both of these
4) Philosophy of school and community
5) Other reasons

_____ 34. All teachers should attempt to relate the vocational implications of their courses in their class presentations.

1) Agree
2) Uncertain
3) Disagree

_____ 35. Vocational students should spend more time in their vocational classes compared to their other subjects.

1) Agree
2) Uncertain
3) Disagree

_____ 36. Vocational classes should be available to only those students who will have the capacity to meet minimum employment requirements.

1) Agree
2) Uncertain
3) Disagree

_____ 37. Vocationally oriented students should begin formal vocational training by grade 10.

1) Agree
2) Uncertain
3) Disagree

_____ 38. Emphasis should be placed on the development of cooperative school-industry programs in grades 11 and 12 wherein a student spends a portion of a day on the job and a portion at school.

1) Agree
2) Uncertain
3) Disagree

_____ 39. Who do you believe has the most influence on student career planning?

1) Parents
2) Teachers
3) Counselors
4) Peer group
5) None of these

ADMINISTRATOR'S SECTION

____ 40. Your community is willing to support a meaningful vocational education program.

1) Agree
2) Uncertain
3) Disagree

____ 41-65. What changes do you plan to make during the next two to three years?

Please indicate your plans in each of the columns below on the following basis:

0) No program in existance -- no change anticipated
1) Major expansion
2) Minor expansion
3) No change
4) Reduction
5) Elimination

	Facilities	Equipment	Courses in Depth	Wider Variety	Longer Periods
Agriculture	41. ___	42. ___	43. ___	44. ___	45. ___
Bus. & Off.	46. ___	47. ___	48. ___	49. ___	50. ___
Dist. Educ.	51. ___	52. ___	53. ___	54. ___	55. ___
Homemaking	56. ___	57. ___	58. ___	59. ___	60. ___
Trade & Industrial	61. ___	62. ___	63. ___	64. ___	65. ___

Data-Collection Device (6A)

EMPLOYERS

INSTRUCTIONS

Read the question carefully. Select the correct or most appropriate answer. Record the number beside your answer in the space provided in the left margin of the page.

Example:

2 1. In which state is the city of Portland located?

1) California
2) Oregon
3) Idaho
4) Washington

On some questions you will be asked to write out your answer.

Begin with Number 5 on the next page. There are no Numbers 1 through 4.

DATA-COLLECTION DEVICE (EMPLOYERS)

Items 1-4 used for identification purposes.

____ 5-8. What is the major industrial classification of this firm?

(Write in) ____.

____ 9-11. What is the Post Office address of this firm? (Indicate the community only. Do not include building or street numbers.)

(Write in) ____

____ 12. Have any of the employees in your firm been prepared through Oregon vocational educational programs, i.e., high schools, public vocational schools or colleges?

1) Yes 2) No

____ 13. Are most of the employees of your firm who were prepared in Oregon vocational education programs working in the occupational areas for which they were trained?

1) Yes 2) No

____ 14. How many of the employees in your firm were prepared in Oregon vocational education programs?

1) 1-5
2) 6-10
3) 11-15
4) 16-20
5) More than 20

We would like you to rate your employees who have been prepared in Oregon vocational educational programs.

How do you rate these employees in their proficiency in the following areas:	1) Strong 2) Adequate 3) Weak 4) Not applicable

(Write the number beside your answer in each box following the skill area.)

Skills and knowledge	Workers in business and office area	Workers in trade and industrial area	Workers in agri-culture	Workers in sales and distribu-tion
MANUAL JOB SKILLS. Refers to skill at using or operating tools, equipment, materials, machines, etc.	____ 15.	____ 16.	____ 17.	____ 18.
JOB PRACTICE KNOWLEDGE. Refers to practical everyday knowledge of work processes, methods, procedures, etc.	____ 19.	____ 20.	____ 21.	____ 22.
JOB THEORETICAL KNOWLEDGE. Refers to knowledge of basic principles and concepts underlying the practical trade work.	____ 23.	____ 24.	____ 25.	____ 26.
MATHEMATICAL SKILLS. Refers to ability to use arithmetic or higher mathematics to solve work problems.	____ 27.	____ 28.	____ 29.	____ 30.
COMMUNICATION SKILLS. Refers to skill at speaking, writing, drafting, sketching, etc., to communicate ideas.	____ 31.	____ 32.	____ 33.	____ 34.
READING AND INTERPRETIVE SKILLS. Refers to skill at reading printed matter, blue prints, tables, diagrams, etc.	____ 35.	____ 36.	____ 37.	____ 38.
CLERICAL SKILLS. Refers to skill at keeping records, making out reports, and other types of routine paper work.	____ 39.	____ 40.	____ 41.	____ 42.
SUPERVISORY SKILLS. Refers to skill at supervising others, e.g., instructing, directing, evaluating, planning, organizing, etc.	____ 43.	____ 44.	____ 45.	____ 46.
OTHER SKILLS. Add what you feel applies to the job that is not covered by the above.	____ 47.	____ 48.	____ 49.	____ 50.

Lack of technical knowledge or skill is not a major cause of job failure. Much more often it is the inability of the individual to work effectively with others.

How do you rate these same employees in their ability to work effectively with:

1) Favorable
2) Don't know
3) Unfavorable
4) Not applicable

(Write the number beside your answer on the line in each box following the skill area.)

Personnel	Workers in business and office area	Workers in trade and industrial area	Workers in agriculture	Workers in sales and distribution
Their supervisors	____ 51.	____ 52.	____ 53.	____ 54.
Those they supervise	____ 55.	____ 56.	____ 57.	____ 58.
Their co-workers	____ 59.	____ 60.	____ 61.	____ 62.
Their customers or patrons	____ 63.	____ 64.	____ 65.	____ 66.

____ 67. Do you believe the high school graduate who has sucessfully completed an Oregon vocational education program is usually better qualified for entry into the world of work than the student who has not had this training?

1) Yes 2) Don't know 3) No

____ 68. Would your firm prefer to hire a high school graduate with two years of vocational training applicable to your business over a student with no vocational training?

1) Yes 2) Don't know 3) No

____ 69. What, in general, is the degree of satisfaction in this firm with employees prepared in Oregon vocational programs?

1) Very satisfied
2) Satisfied
3) Satisfied and dissatisfied
4) Dissatisfied
5) Very dissatisfied

Occupation - skill inventory (Employers)

Experiences may be provided to permit students to acquire skills and/or knowledge which are essential to a particular job. Educators have identified those items in the left-hand column as skills that may be developed through experiences in the high school. Please indicate the different occupations represented in your firm in the spaces provided. In the vertical column, circle your responses in the following manner:

2 = Essential:	the skill or knowledge is essential for an employee in order for him to maintain his occupation
1 = Desirable:	the skill or knowledge is desirable but not essential for this occupation
Omit if Unimportant:	the skill or knowledge is not related to this occupation

Skill in or Knowledge of	Occupations			
1. Workmanship attitudes (enthusiasm, initiative, drive, etc.)	2 1	2 1	2 1	2 1
2. Personal grooming	2 1	2 1	2 1	2 1
3. Personnel relations (among subordinates, co-workers & supervisors)	2 1	2 1	2 1	2 1
4. Customer relations	2 1	2 1	2 1	2 1
5. Leadership ability	2 1	2 1	2 1	2 1
6. Supervision of personnel	2 1	2 1	2 1	2 1
7. Mgt. of personnel, (interview, selection, promotion, policy formulation)	2 1	2 1	2 1	2 1
8. Oral communication (intonation, enunciation, pleasantness, grammar, etc.)	2 1	2 1	2 1	2 1
9. Written communication (grammar, punctuation, vocabulary, spelling, etc.)	2 1	2 1	2 1	2 1

Occupation - skill inventory (Employers) Continued

Skill in or Knowledge of	Occupations			
10. Reading technical materials	2 1	2 1	2 1	2 1
11. Writing technical materials	2 1	2 1	2 1	2 1
12. Speech prep. & delivery	2 1	2 1	2 1	2 1
13. Office procedures	2 1	2 1	2 1	2 1
14. Typewriting	2 1	2 1	2 1	2 1
15. Legible handwriting	2 1	2 1	2 1	2 1
16. Telephone procedures	2 1	2 1	2 1	2 1
17. Filing systems	2 1	2 1	2 1	2 1
18. Business correspondence	2 1	2 1	2 1	2 1
19. Bookkeeping principles	2 1	2 1	2 1	2 1
20. Record keeping	2 1	2 1	2 1	2 1
21. Shorthand	2 1	2 1	2 1	2 1
22. Office machine operation	2 1	2 1	2 1	2 1
23. Payroll procedures	2 1	2 1	2 1	2 1
24. PBX operation	2 1	2 1	2 1	2 1
25. Negotiable instruments (checks, notes, drafts, etc.)	2 1	2 1	2 1	2 1
26. Contracts	2 1	2 1	2 1	2 1
27. Titles, warranty deeds, and related sales instruments	2 1	2 1	2 1	2 1

Occupation - skill inventory (Employers) Continued

Skill in or Knowledge of	Occupations			
28. Salesmanship principles (demonstration & selling)	2 1	2 1	2 1	2 1
29. Advertising principles	2 1	2 1	2 1	2 1
30. Display principles (color, form, balance, etc.)	2 1	2 1	2 1	2 1
31. Production management	2 1	2 1	2 1	2 1
32. Investment principles	2 1	2 1	2 1	2 1
33. Insurance principles	2 1	2 1	2 1	2 1
34. Marketing procedures	2 1	2 1	2 1	2 1
35. Basic arithmetical principles	2 1	2 1	2 1	2 1
36. Business mathematics	2 1	2 1	2 1	2 1
37. Shop mathematics	2 1	2 1	2 1	2 1
38. Elements of algebra	2 1	2 1	2 1	2 1
39. Elements of geometry	2 1	2 1	2 1	2 1
40. Elems. of trigonometry	2 1	2 1	2 1	2 1
41. Elems. of statistics	2 1	2 1	2 1	2 1
42. Schematic reading	2 1	2 1	2 1	2 1
43. Blueprint reading	2 1	2 1	2 1	2 1
44. Preparing graphs, charts, other visual media	2 1	2 1	2 1	2 1

Occupation - skill inventory (Employers) Continued

Skill in or Knowledge of	Occupations			
45. Mechanical drawing	2 1	2 1	2 1	2 1
46. Drafting	2 1	2 1	2 1	2 1
47. Map reading	2 1	2 1	2 1	2 1
48. Surveying principles	2 1	2 1	2 1	2 1
49. Food planning & prep'n	2 1	2 1	2 1	2 1
50. Laboratory procedures	2 1	2 1	2 1	2 1
51. Chemistry symbols	2 1	2 1	2 1	2 1
52. Sanitation principles	2 1	2 1	2 1	2 1
53. First aid procedures	2 1	2 1	2 1	2 1
54. Safety principles	2 1	2 1	2 1	2 1
55. Fire fighting procedures	2 1	2 1	2 1	2 1
56. Operating automotive equip.	2 1	2 1	2 1	2 1
57. Maintaining automotive equipment	2 1	2 1	2 1	2 1
58. Repairing automotive equipment	2 1	2 1	2 1	2 1
59. Operating industrial equip.	2 1	2 1	2 1	2 1
60. Maintaining indust. equip.	2 1	2 1	2 1	2 1
61. Repairing industrial equip.	2 1	2 1	2 1	2 1
62. Use of hand tools (wood)	2 1	2 1	2 1	2 1
63. Use of hand tools (mech.)	2 1	2 1	2 1	2 1

Skill in or Knowledge of	Occupations			
64. Use of hand tools (mach.)	2 1	2 1	2 1	2 1
65. Use of wood bench equip.	2 1	2 1	2 1	2 1
66. Use of metal bench equip.	2 1	2 1	2 1	2 1
67. Use of elect. testing equip.	2 1	2 1	2 1	2 1
68. Electric welding	2 1	2 1	2 1	2 1
69. Gas welding & cutting	2 1	2 1	2 1	2 1
70. Soldering	2 1	2 1	2 1	2 1
71. Basic electricity princ.	2 1	2 1	2 1	2 1
72. Basic electronics princ.	2 1	2 1	2 1	2 1
73. Principles of heating	2 1	2 1	2 1	2 1
74. Principles of pressure	2 1	2 1	2 1	2 1
75. Mechanical principles	2 1	2 1	2 1	2 1
76. Properties of wood	2 1	2 1	2 1	2 1
77. Properties of metal	2 1	2 1	2 1	2 1
78. Properties of textiles	2 1	2 1	2 1	2 1
79. Properties of stone, brick and concrete	2 1	2 1	2 1	2 1
80. Construction principles and codes	2 1	2 1	2 1	2 1
81. Construction materials	2 1	2 1	2 1	2 1

Occupation - skill inventory (Employer) Continued

Skill in or Knowledge of	Occupations			
82. Wood finishing	2 1	2 1	2 1	2 1
83. Metal finishing	2 1	2 1	2 1	2 1
84. Cost estimation	2 1	2 1	2 1	2 1
85. Cost analysis	2 1	2 1	2 1	2 1
86. Car or truck operation	2 1	2 1	2 1	2 1

Data-Collection Device (6B and 7B)

EMPLOYEES

INSTRUCTIONS

Read the question carefully. Select the correct or most appropriate answer. Record the number beside your answer in the space provided in the left margin of the page.

Example:

2 1. In which state is the city of Portland located?

1) California 3) Idaho
2) Oregon 4) Washington

On some questions you will be asked to write out your answer.

Begin with Number 5 on the next page. There are no Numbers 1 through 4.

DATA-COLLECTION DEVICE (EMPLOYEES)

Items 1-4 used for county and city identification purposes.

___ 5. What is your sex?

1) Male
2) Female

___ 6. What is your age?

1) Less than 23
2) 23-29
3) 30-34
4) 35-39
5) 40-44
6) 45-49
7) 50-54
8) 55-59
9) 60 or more

___ 7-9. What is your Post Office address? (Indicate the community only. Do not include house and street number.)

____

___ 10. What is the highest grade (or year) of school you have completed?

1) 8 years or less
2) 1-3 years of high school
3) 4 years of high school
4) 1-2 years of college
5) More than 2 years of college

___ 11. How did you get your present or last full-time job?

1) Response to a want ad
2) Private employment agency
3) Public employment agency
4) Labor union
5) Help of friend or relative
6) Other

___ 12-14. What is your present full-time occupation? (Indicate last full-time occupation if presently unemployed or employed part-time.)

(Write in) ______________________________________

___ 15. How long have you been working at this occupation?

1) Less than 6 months
2) 6 months to a year
3) 1-2 years
4) 3-5 years
5) 6-10 years
6) More than 10 years

NOTE: If you have never had any vocational or job training skip to number 62.

Have you ever been enrolled in any of the following vocational or job training programs?

(Indicate your answer by writing the appropriate number on the line in each box.)	1) Yes 2) No	For what occupation were you trained? (Write in)	Did you finish the program? 1) Yes 2) No
A VOCATIONAL PROGRAM IN HIGH SCHOOL (Example - agriculture, auto mechanics, secretarial, merchandising, home economics)	___16.	17-19.	___20.
A TECHNICAL PROGRAM IN A JUNIOR COLLEGE	___21.	22-24.	___25.
A PROGRAM IN A TECHNICAL INSTITUTE (Example - draftsman, electronics, designing)	___26.	27-29.	___30.
A TRAINING PROGRAM IN A PUBLIC OR PRIVATE VOCATIONAL SCHOOL (Example - commercial art, printing, beautician)	___31.	32-34.	___35.
APPRENTICESHIP PROGRAM LEADING TO JOURNEYMAN STATUS	___36.	37-39.	___40.
A VOCATIONAL TRAINING PROGRAM IN THE ARMED FORCES	___41.	42-44.	___45.
A PROGRAM IN A COMPANY TRAINING SCHOOL ATTENDED FULL-TIME FOR SIX WEEKS OR MORE	___46.	47-49.	___50.
ANY OTHER VOCATIONAL TRAINING PROGRAM (Does not include on-the-job training given informally by supervisors or other workers)	___51.	52-54.	___55.

NOTE: If you marked "yes" for more than one training program on the preceding page and you worked in the area for which you were trained, answer questions 56 through 61 in terms of your most recent training.

How did the: (1) tools and equipment, (2) work methods, and (3) work materials used on your first full-time job compare with those used in your vocational or job training courses? (It is assumed you worked in the area for which you were trained.)

_____ 56. Tools and equipment

1) Identical or almost so
2) Little difference
3) Very much different
4) "Tools and equipment" didn't apply to my job

_____ 57. If the answer to question number 56 was "3" (Very much different), how long did it take to learn to effectively use the tools and equipment?

1) A few weeks
2) About three to six months
3) About six months to a year
4) More than a year

_____ 58. Work methods

1) Identical or almost so
2) Little difference
3) Very much different
4) "Work methods" didn't apply to my job

_____ 59. If the answer to question number 58 was "3" (Very much different), how long did it take to learn the work methods?

1) A few weeks
2) About three to six months
3) About six months to a year
4) More than a year

_____ 60. Work materials

1) Identical or almost so
2) Little difference
3) Very much different
4) "Work materials" didn't apply to my job

_____ 61. If the answer to question number 60 was "3" (Very much different), how long did it take to learn to effectively use the work materials?

1) A few weeks
2) About three to six months
3) About six months to a year
4) More than a year

_____ 62. Where do you live?

1) In a town or a city
2) In a suburb
3) On a farm of less than 10 acres
4) On a farm of 10 acres or more
5) In the country but not on a farm

OREGON

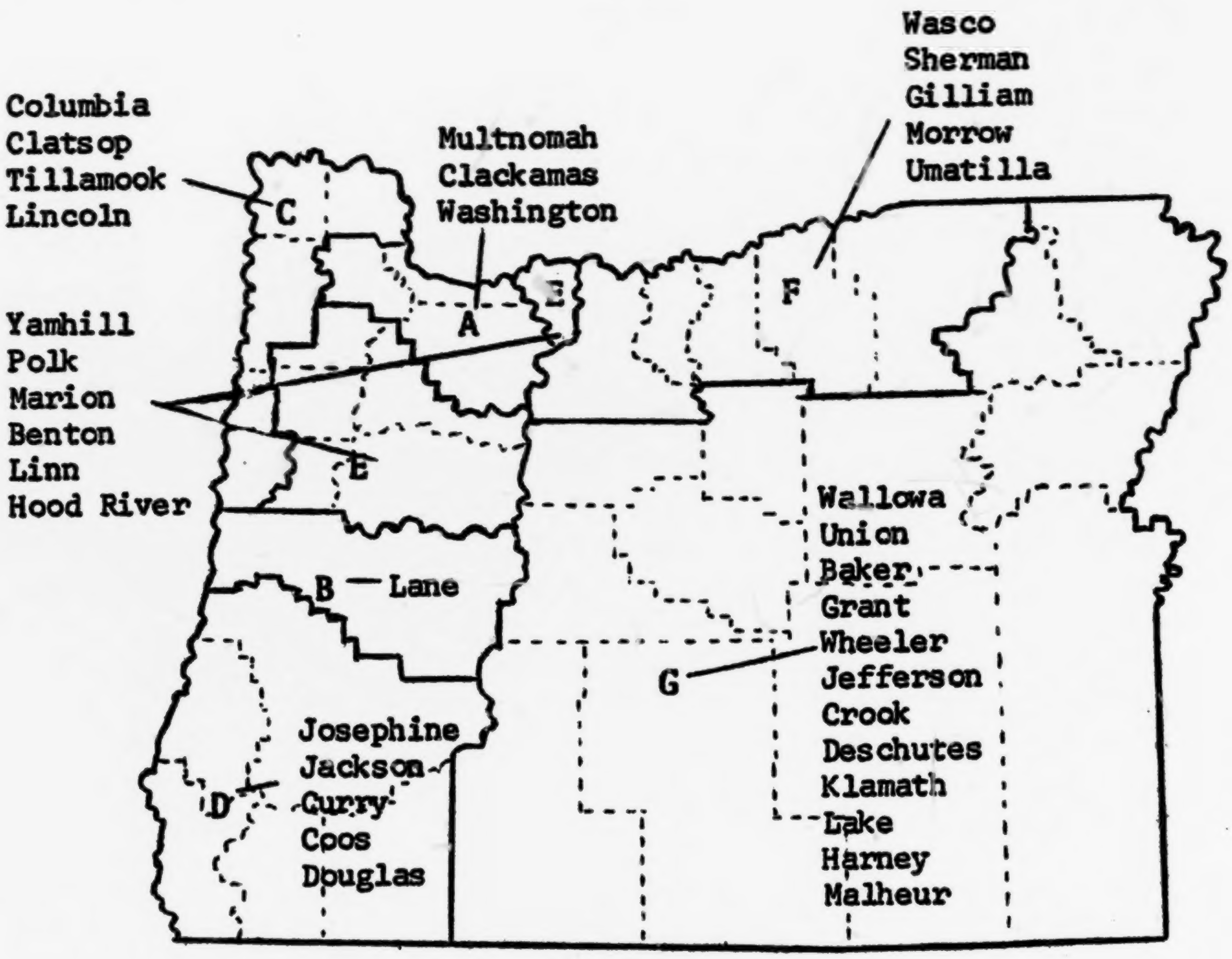
Wasco
Sherman
Gilliam
Morrow
Umatilla
Columbia
Clatsop
Tillamook
Lincoln
C
Multnomah
Clackamas
Washington
A
E
F
Yamhill
Polk
Marion
Benton
Linn
Hood River
E
Wallowa
Union
Baker
Grant
Wheeler
Jefferson
Crook
Deschutes
Klamath
Lake
Harney
Malheur
G
B
Lane
Josephine
Jackson
Curry
Coos
Douglas
D

Figure I

Refer to Figure I for questions 63 and 64.

_____ 63. This figure divides Oregon's 36 counties into seven areas. In which area of the state do you live?

1) A	3) C	5) E	7) G
2) B	4) D	6) F	

_____ 64. In which area of the state would you prefer to work?

1) A	4) D	7) G
2) B	5) E	8) None of the above - prefer to work in another state.
3) C	6) F	

______ 65. If you couldn't find the kind of job you want in the area where you want to live would you

1) Move to where the job is available even if it is not where you want to live or
2) Stay in the community or area in which you want to live and find a different and less desirable job.

______ 66. If answer to question number 65 is "Move to where job is available . . ." how far might you be willing to move from your present residence in order to work at the kind of job you want?

1) 0-25 miles
2) 26-50 miles
3) 51-100 miles
4) 101-200 miles
5) Willing to go wherever job is available

______ 67. How far might you be willing to travel each day (one way) from your place of residence to your place of work?

1) 0-10 miles
2) 11-20 miles
3) 21-30 miles
4) 31-40 miles
5) 41-50 miles
6) More than 50 miles

______ 68. How much time might you be willing to spend in travel each day (one way) from your place of residence to your place of work?

1) 0-10 minutes
2) 10-30 minutes
3) 30 minutes to an hour
4) More than an hour

The next ten questions are an attempt to determine the degree of employee job satisfaction. The questions call for your evaluation of the job itself, the employing organization, and your own feelings of satisfaction or dissatisfaction regarding the job.

______ 69. Which statement best tells how good a job you have?

1) The job is an excellent one, very much above the average.
2) The job is a fairly good one.
3) The job is only average.
4) The job is not as good as average.
5) The job is a very poor one, very much below the average.

______ 70. Which statement best describes your feelings about your job?

1) I am very satisfied and happy on this job.
2) I am fairly well satisfied on this job.
3) I am neither satisfied nor dissatisfied.
4) I am a little dissatisfied and unhappy on this job.
5) I am very dissatisfied and unhappy on this job.

_____ 71. How much of the time are you satisfied with your job?

1) Most of the time
2) A good deal of the time
3) About half of the time
4) Occasionally
5) Seldom

_____ 72. What kind of an organization do you work for?

1) It is an excellent organization to work for -- one of the best I know of.
2) It is a good organization to work for but not one of the best.
3) It is only an average organization to work for. Many others are just as good.
4) It is below average as an organization to work for.
5) It is probably one of the poorest organizations to work for that I know of.

_____ 73. How do your feelings compare with those of other people you know?

1) I like my job much better than most people like theirs.
2) I like my job better than most people like theirs.
3) I like my job about as well as most people like theirs.
4) I dislike my job more than most people dislike theirs.
5) I dislike my job much more than most people dislike theirs.

_____ 74. How do you feel about the work you do on your job?

1) The work is very enjoyable. I very much like to do the work called for on this job.
2) The work is pleasant and enjoyable.
3) The work is just about average. I don't have any feelings about whether it is pleasant or not.
4) The work I do is not pleasant.
5) The work I do is very unpleasant. I dislike it.

_____ 75. How do you describe the general conditions which affect your work or comfort on your job?

1) General working conditions are very good, much better than average for this kind of a job.
2) In general, working conditions are good, better than average.
3) General conditions are about average, neither good nor bad.
4) General working conditions are poor -- not as good as the average for this kind of job.
5) General working conditions are very bad.

____ 76. How do you feel about changing your job?

1) I do not want to change jobs even for more money because this is a good one.
2) I am not eager to change jobs but would do so if I could make more money.
3) This job is as good as the average and I would just as soon have it as any other.
4) I would take almost any other job in which I could earn as much as I am earning here.
5) I would quit this job at once if I had anything else to do.

____ 77. Suppose you have a very good friend who is looking for a job in your line of work and you know of a vacancy in this organization which your friend is qualified to fill. Would you:

1) Recommend this job as a good one to apply for?
2) Recommend this job but caution your friend about its shortcomings.
3) Tell your friend about the vacancy but not anything else, then let him decide whether to apply or not?
4) Tell your friend about the vacancy but suggest that he or she look for vacancies elsewhere before applying?
5) Try to discourage your friend from applying by telling the bad things about the job?

____ 78. Generally speaking, how well satisfied are you with your job?

1) Very satisfied
2) Satisfied
3) About half and half
4) Dissatisfied
5) Very dissatisfied

Occupation - skill inventory (Employees)

Experiences may be provided to permit students to acquire skills and/or knowledge which are essential to a particular job. Educators have identified those items in the left-hand column as skills that may be developed through experiences in the high school. Please indicate your present occupation in the space provided. In the vertical column, circle your responses in the following manner:

2 = Essential: the skill or knowledge is essential for me in order for me to maintain my present occupation
1 = Desirable: the skill or knowledge is desirable but not essential in my present occupation.
Omit if Unimportant: the skill or knowledge is not related to my present occupation

Skill in or Knowledge of	Present Occupation: (Write In)	
1. Workmanship attitudes (enthusiasm, initiative, drive, etc.)	2	1
2. Personal grooming	2	1
3. Personnel relations (among subordinates, co-workers and supervisors)	2	1
4. Customer relations	2	1
5. Leadership ability	2	1
6. Supervision of personnel	2	1
7. Mgt. of personnel (interview, selection, promotion, policy formulation)	2	1
8. Oral communication (intonation, enunciation, pleasantness, grammar, etc.)	2	1
9. Written communication (grammar, punctuation, vocab., spelling, etc.)	2	1
10. Reading technical materials	2	1
11. Writing technical materials	2	1
12. Speech prep. & delivery	2	1

Occupation - skill inventory (Employees) Continued

Skill in or Knowledge of	Present Occupation: (Write In)	
13. Office procedures	2	1
14. Typewriting	2	1
15. Legible handwriting	2	1
16. Telephone procedures	2	1
17. Filing systems	2	1
18. Business correspondence	2	1
19. Bookkeeping principles	2	1
20. Record keeping	2	1
21. Shorthand	2	1
22. Office machine operation	2	1
23. Payroll procedures	2	1
24. PBX operation	2	1
25. Negotiable instruments (checks, notes, drafts, etc.)	2	1
26. Contracts	2	1
27. Titles, warranty deeds, & related sales instruments	2	1
28. Salesmanship principles (demonstration and selling)	2	1
29. Advertising principles	2	1
30. Display principles (color, form, balance, etc.)	2	1

Occupation - skill inventory (Employees) Continued

Skill in or Knowledge of	Present Occupation: (Write In)	
31. Production management	2	1
32. Investment principles	2	1
33. Insurance principles	2	1
34. Marketing procedures	2	1
35. Basic arithmetical principles	2	1
36. Business mathematics	2	1
37. Shop mathematics	2	1
38. Elements of algebra	2	1
39. Elements of geometry	2	1
40. Elements of trigonometry	2	1
41. Elements of statistics	2	1
42. Schematic reading	2	1
43. Blueprint reading	2	1
44. Preparing graphs, charts, other visual media	2	1
45. Mechanical drawing	2	1
46. Drafting	2	1
47. Map reading	2	1
48. Surveying principles	2	1
49. Food planning & preparation	2	1

Occupation - skill inventory (Employees) Continued

Skill in or Knowledge of	Present Occupation: (Write In)	
50. Laboratory procedure	2	1
51. Chemistry symbols	2	1
52. Sanitation principles	2	1
53. First aid procedures	2	1
54. Safety principles	2	1
55. Fire fighting procedures	2	1
56. Operating automotive equipment	2	1
57. Maintaining automotive equipment	2	1
58. Reparing automotive equipment	2	1
59. Operating industrial equipment	2	1
60. Maintaining industrial equipment	2	1
61. Repairing industrial equipment	2	1
62. Use of hand tools (wood)	2	1
63. Use of hand tools (mech.)	2	1
64. Use of hand tools (machinist)	2	1
65. Use of wood bench equipment	2	1
66. Use of metal bench equipment	2	1
67. Use of electrical testing equip.	2	1
68. Electric welding	2	1

Occupation - skill inventory (Employees) Continued

Skill in or Knowledge of	Present occupation: (Write In)	
69. Gas welding & cutting	2	1
70. Soldering	2	1
71. Basic electricity principles	2	1
72. Basic electronics principles	2	1
73. Principles of heating	2	1
74. Principles of pressure	2	1
75. Mechanical principles	2	1
76. Properties of wood	2	1
77. Properties of metal	2	1
78. Properties of textiles	2	1
79. Properties of stone, brick,concrete	2	1
80. Construction principles & codes	2	1
81. Construction materials	2	1
82. Wood finishing	2	1
83. Metal finishing	2	1
84. Cost estimation	2	1
85. Cost analysis	2	1
86. Car or truck operation	2	1

CHAPTER III

PROJECTION OF
MAJOR OCCUPATIONAL GROUPS
1965 - 1970

Projection of Major Occupational Groups
1965-1970

In the tables that follow in this section are presented the projections of the number of employed persons, by occupational groups for 1965 and 1970 for seven economic areas of the state. The data have been derived from existing information about trends in employment and industrial development for the state and nation. By an adjustment of past trends for the most likely changes there has been developed a set of projections of the size of occupational groups for 1970. These are presented in summary form together with instructions for additional adjustment and manipulation in order to derive additional data.

The first figure projected was total employment for the state in 1970. This was derived from a projection of total population, an independent projection of employment, and a rationalization of the two figures. Once a figure for employment was decided upon, the balance of the data became basically a derivation of component parts from known or calculated ratios between the components. The process of disaggregation was chosen rather than the reverse process of aggregating a large number of smaller component projections because it is much more economical, but still capable of yielding results which are quite useful.

Two methods were used to derive the control total of 800,000 for 1970 for Oregon. An average increase in the employed labor force from

1950-1964 was calculated and the increment added to reported employment from 1960 Census data. This resulted in a figure of 805,000. The second calculation was to apply an employed/population ratio derived from census data to a projection of 2,058,000 population for 1970.[1] This resulted in 792,000 projected total employment. The first figure was judged to be high because it relied upon job count rather than counting people holding the jobs, and the second figure was judged to be conservative because it does not reflect adequately the very high economic growth rates which characterize the period 1960-65. A legitimate compromise seemed to be the 800,000 figure which was adopted.

The next step was to divide the 800,000 among the areas of the state. The areas chosen conform to the United States Census divisions and to the Oregon State Board of Census areas. They are consistent with economic specializations known to exist in each area, and they group counties which have experienced similar growth rates in the past. Ratios of (1) population in the areas to the state total for 1957-64, and (2) of the 16-64 age group in each area to that in the state for 1950 and 1960 were calculated. Where an area showed a clear trend toward a larger percentage of the state total population the per cent projected for that area was increased for 1970 and similarly reduced for those areas showing a consistent decline.

The application of the percentages derived as explained above resulted in the allocation of the control total of 800,000 to the seven subregions of the state. Thus Area A (Multnomah, Clackamas, Washington) is expected to have 345,000 or 41 per cent of the total in 1970; 10 per cent or 80,000 will be found in (Lane County) Area B and so on as listed at the column foot in Table 8.

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[1] Oregon State Board of Census, Population Bulletin P-10, Portland, Oregon, 1962.

The occupational groups to which the total for the state and for each area would be allocated were the major subdivision of Table 120 of the 1960 United States Census.[2] Further disaggregation of these major groups can be accomplished by methods which will be explained following the explanation for the major groups and areas.

The detailed data on occupational groups for the counties of Oregon were taken from Table 125 which was purchased as a special publication from the United States Bureau of the Census.[3] This table does not separate several occupational groups in the same fashion as Table 120 does for the state as a whole, and the next step was to divide (1) farmers from managers, (2) private household from service, and (3) farm labor from laborers. This proved to be a relatively easy task because Table 125 reports the occupational groups cross-classified by Standard Industrial Classification; thus, by simple addition and subtraction, the divisions needed were constructed. Thus, the farmer-manager group occurring in the Agriculture SIC column was subtracted from the combined group in the total occupation column to divide farmers from non-agricultural managers. The same process was applied to separate laborers from farm laborers. In the case of service-private household division an examination of reports from the Oregon Department of Employment and Table 120 of the Census revealed that approximately 24 per cent of the total group was private household employment. This percentage was then applied to the combined group in each county to divide it into the two components.

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[2] Detailed Characteristics, United States Census of Population, 1960 Oregon, U.S. Department of Commerce, Bureau of the Census, Washington, 1962, pp. 39-240; 39-245.

[3] Occupational Groups, by SIC Groups, by County, by Sex, 1960, Oregon; U.S. Bureau of the Census, special purchase publication, Washington, D.C. 1962.

After the divisions explained above had been completed, the figures for the occupational subdivisions in each county were combined to give the total for the areas of the state for 1960. Each figure for a major occupational group in each area was then divided by the total for the area to get a percentage distribution by occupational group in the area. These figures were rounded and justified to 100 per cent in each case.

In order to estimate the per cent of each area's total for 1970 to be allocated to each occupational group in the area, a ratio was worked which related the per cent in the group in the state in 1960 and 1970 to the per cent in the occupational group in the substate area in 1960 and solving this ratio for the 1970 percentage figure for the area. Thus, for Professional-Technical group in Area 1a the ratio to be solved was 10.6:8.6 :: 13.1:x and the result was 10.6 per cent for the group in the area in 1970. Since the per cent for the group for the state as a whole had already been adjusted to reflect increases or decreases in the occupational groups the change would be reflected in the substate areas in proportion to their population in the groups in 1960 relative to the state. The control totals allocated to the substate areas acted to adjust the areas one with another. Thus, Lane County compared to Eastern Oregon would show a larger increase in rising occupations because it is increasing as a per cent of the state total while the eastern part of the state is generally declining as a per cent of the state total.

The percentages derived from the step described above were applied to the 1970 total for the area to obtain the number in each occupational group, and this number then rounded to the nearest 100. This process was repeated for each of the substate areas with the results shown in Tables 1 through 8. The same process was carried out for the state and the areas for 1965 with the results shown in the same set of tables.

An additional adjustment was made in the data for Area A (Portland SMSA), in order to exclude Clark County, Washington employment. From reports of the Oregon Board of Census and the detailed reports of population characteristics from the United States Census it was determined that 87 per cent of the employment could be allocated to Oregon and the remaining 13 per cent to Clark County. The tables in this report reflect this adjustment.

One additional allocative adjustment was deemed desirable in order to reflect the distribution of occupations more accurately. The number of "not reported" increased rather sharply from 1960 to 1970 because the category increased markedly between 1950 and 1960. It is unlikely that the 1970 census data will show the same change and all but 14,000 of the 45,000 originally projected for the category were distributed to the other groups in the state in proportion to their part of the total. There is no information to show whether the "not reported" are concentrated in one or several occupations or are evenly distributed, and the best judgment seemed therefore to be to distribute them evenly throughout the occupational groups.

Further division of the major groups can be accomplished in essentially the same fashion; however, the smaller the component to be projected the greater the degree of caution required in the work. Careful investigation of trends must be made to be sure that account is taken of divergent or dissimilar trends within the major group. Thus, not all the components of the craftsmen group will increase at the same rate. The first approximation for each group would be related to the change from 1950-60 and to the per cent which the subdivision has of the major group in 1960. Further adjustment should account for trends in various industries employing the occupational group. It should be emphasized that such adjustments are made in part by the analyst's judgment, and are not therefore subject to any exact analysis to determine their statistical reliability.

For illustrative purposes, suppose that the occupation to be projected is excavating, grading, and road machinery operators. There were 1870 of them in Oregon in 1950 and 3348 in 1960 which is a net increase of 79 per cent. The increase at the national level was 102.8 per cent so that the Oregon growth is representative although somewhat below average. The expansion is obviously related to the high level of road building and other construction activity which has extended into the 1960's and will almost surely continue well into the 1970's. An extension of the growth trend is clearly warranted at the level of the previous decade at least. The major group of which this occupation is a part is expected to increase in Oregon during the 1960-70 decade but at less than the average of all occupations combined.

Excavating, grading, and road machinery operators were .02 per cent of the major occupational group in 1950 in Oregon and slightly over .036 per cent in 1960. The construction industry (SIC 15,16,17) is not expected to grow as rapidly in the next decade as during the last, largely because the growth of firms has already taken place and further expansion of building can be in part absorbed by existing capacity. These factors in combination lead to a first judgment allocation of .04 per cent to the occupation for 1970 or a total of 4,170 compared to 3348 in 1960. It should be noted that this is a projected total net increase excluding whatever number will be needed during the decade for replacement.

In addition to the type of information used above for calculation of expansion or contraction of an occupational group, further refinement may be accomplished by informal interview with employers. In the case demonstrated, a presentation of the first effort projection to several employers would elicit directed comments which could be useful in deciding such matters as probable replacement needs, or information about technological advance which would influence near future employment. It is recommended however that the interview be relatively unstructured and as informal as possible in order to allow a maximum of freedom to the employer to speculate upon changes which he may know about. Questions should be raised by the interviewer designed to get information about technological change and its potential impact on the volume of employment. The question of the impact on the level of skill required should be explored although it seems unlikely that much information of a specific and quantifiable nature can be obtained.

A source of interview information which should be explored in the case being illustrated is the equipment manufacturer or dealer. His contribution would be to indicate probable changes in new equipment which would affect the type of skill required. It would be desirable, but very difficult, to trace the matter of technological change still further even into such things as new components for equipment, new methods of powering the machinery, new metals or plastics which might change manufacturing processes and shift the capital-labor inputs mix still further. Technological change is such a complex set of relationships that it is difficult to know how far the research should or could be pursued, but some idea of the type needed can be gleaned from this rather simple example.

An additional aspect of the impact of technological change is the inter-industry change resulting from shifts in any one industry. For example, a change in a duplicating process requiring a new kind of photo-sensitive paper sets up a chain of demands upon such industries as paper, chemicals, plastics, and electrical equipment. These changes in turn trigger other developments in the supplying industries such as other chemical firms, petroleum refiners, and the metal fabricating group.

Much of the work necessary to project manpower requirements using techniques such as input/output analysis has been undertaken at the national level. Some reports are beginning to appear[4] and others will become available in the near future.

It is suggested that further research along the lines demonstrated above should be confined to a few industries which (1) will be of large importance to the economy of Oregon in the next decade, or (2) which seem likely to be especially dynamic in their technological development. Among the industries of the first category would be lumber and wood products (SIC 24), transportation (SIC 40-47), food and kindred products (SIC 20), wholesale and retail trade (SIC 50-59), and others as time and money permit. Among those industries in the second classification would be those in the metal and metal fabrication group, electrical machinery, and contract construction.

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[4] See: Survey of Current Business, U.S. Dept. of Commerce, Nov. 1964, May 1965, Sept. 1965; Monthly Labor Review, U.S. Dept. of Labor, July 1965, pp. 841-850.

Identification of the industries to be studied should be made from projections made in this report and from further refinements as suggested. These decisions (on which industries to study first) are not critical in the long run but are absolutely essential in order to make a beginning on the later stages of study.

The geographical location of the additional persons needed or changed skills required can be made by associating the skill group with one of the larger occupational groups already projected and by reference to the industry-occupation cross classification table.

Table 1
Occupation Groups, 1960, 1965, 1970
Area A

Occupational Group	1960[1]	Percent 1960	1965	Percent 1965	1970	Percent 1970
Professional, Technical, & Kindred	33399	12.0	42000	13.4	51000	14.8
Farmers	4493	1.6	4000	1.2	3000	.8
Non-farm Managers	27734	10.0	28000	8.9	27000	7.8
Clerical & Kindred	47085	17.0	57000	18.2	67000	19.4
Sales	25293	9.1	29000	9.2	32000	9.2
Craftsmen	37304	13.4	42000	13.3	45000	13.2
Operatives	41489	15.0	49000	15.6	56000	16.2
Private Household	7600	2.7	9000	2.9	11000	3.1
Service	24413	8.8	30000	9.4	34000	9.9
Farm Laborers	4187	1.5	3000	1.0	2000	.6
Non-farm Laborers	13663	5.0	14000	4.4	13000	3.8
Not Reported	10874	3.9	8000	2.5	4000	1.2
Total	277534	100.0	315000	100.0	345000	100.0

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 121, adjusted to remove Clark County, Washington.

Area A: Multnomah, Clackamas, and Washington Counties.

Table 2
Occupation Groups 1960, 1965, 1970
Area B

Occupational Group	1960[1]	Percent 1960	1965	Percent 1965	1970	Percent 1970
Professional,Technical, & Kindred	6617	11.5	9300	12.9	12100	14.2
Farmers	1207	2.1	1200	1.7	900	1.1
Non-farm Managers	5694	9.9	6600	9.2	7100	8.4
Clerical & Kindred	6519	11.3	8600	11.9	10800	12.7
Sales	4271	7.4	5400	7.5	6400	7.5
Craftsmen	8301	14.5	10300	14.3	12100	14.2
Operatives	10355	18.0	13300	18.5	16200	19.0
Private Household	1515	2.6	1900	2.6	2500	2.9
Service	4867	8.5	6500	9.0	8000	9.5
Farm Laborers	865	1.5	900	1.3	800	.9
Non-farm Laborers	5992	10.4	6600	9.2	6700	7.9
Not Reported	1302	2.3	1400	1.9	1400	1.7
Total	57505	100.0	72000	100.0	85000	100.0

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 125, (Special publication) Labor Force and Employment by SIC Groups and Occupational Groups by Sex, 1960.

Area B: Lane County

Table 3
Occupation Groups 1960, 1965, 1970
Area 1a

Occupational Group	1960[1]	Percent 1960	1965	Percent 1965	1970	Percent 1970
Professional, Technical, & Kindred	2738	8.6	3200	9.7	3800	10.9
Farmers	1338	4.2	1100	3.3	800	2.3
Non-farm Managers	3396	10.7	3300	10.0	3200	9.1
Clerical & Kindred	2631	8.3	3000	9.1	3500	10.0
Sales	1818	5.7	1900	5.9	2100	6.0
Craftsmen	3949	12.4	4100	12.4	4300	12.3
Operatives	6216	19.6	6700	20.3	7500	21.4
Private Household	810	2.6	1000	3.0	1200	3.4
Service	2603	8.2	2900	8.8	3300	9.5
Farm Laborers	1412	4.4	1300	3.9	1100	3.1
Non-farm Laborers	3894	12.3	3600	10.9	3300	9.5
Not Reported	966	3.0	900	2.7	900	2.5
Total	31771	100.0	33000	100.0	35000	100.0

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 125, (Special publication) Labor Force & Employment by SIC Groups and Occupational Groups by Sex, 1960.

Area 1a: Columbia, Clatsop, Tillamook, Lincoln Counties

Table 4
Occupation Groups 1960, 1965, 1970
Area 1b

Occupational Group	1960[1]	Percent 1960	1965	Percent 1965	1970	Percent 1970
Professional, Technical, & Kindred	7610	9.3	9500	10.4	11900	11.7
Farmers	2884	3.5	2400	2.6	2000	2.0
Non-farm Managers	8408	10.3	9100	10.0	9200	9.0
Clerical & Kindred	7657	9.4	9300	10.2	11200	11.0
Sales	4858	5.9	5300	5.8	6100	6.0
Craftsmen	11202	13.7	12400	13.6	14000	13.7
Operatives	15434	18.9	17900	19.7	20900	20.5
Private Household	2083	2.6	2600	2.9	3300	3.2
Service	6692	8.2	8000	8.8	9500	9.3
Farm Laborers	2516	3.1	2300	2.5	2000	2.0
Non-farm Laborers	10178	12.5	10000	11.0	9800	9.5
Not Reported	2140	2.6	2200	2.4	2100	2.1
Total	81662	100.0	91000	100.0	102000	100.0

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 125, (Special Publication) Labor Force & Employment by SIC Groups and Occupational Groups by Sex, 1960.

Area 1b: Coos, Curry, Douglas, Jackson, Josephine Counties

Table 5
Occupation Groups 1960, 1965, 1970
Area 2

Occupational Group	1960[1]	Percent 1960	1965	Percent 1965	1970	Percent 1970
Professional, Technical,& Kindred	12383	12.5	16400	13.9	20600	15.5
Farmers	6316	6.4	5800	4.9	4700	3.5
Non-farm Managers	8602	8.7	9600	8.1	10000	7.5
Clerical & Kindred	12163	12.3	15600	13.2	18800	14.1
Sales	6818	6.9	8300	7.0	9300	7.0
Craftsmen	11704	11.8	13900	11.8	15700	11.8
Operatives	14640	14.8	18100	15.4	21200	16.0
Private Household	2848	2.9	3700	3.1	4500	3.4
Service	9147	9.2	11700	9.9	14000	10.5
Farm Laborers	4600	4.6	4500	3.8	4000	3.0
Non-farm Laborers	7044	7.1	7500	6.3	7300	5.5
Not Reported	2806	2.8	2900	2.5	2900	2.2
Total	99071	100.0	118000	100.0	133000	100.0

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 125, (Special Publication) Labor Force & Employment by SIC Groups and Occupational Groups by Sex, 1960.

Area 2: Linn, Benton, Marion, Polk, Yamhill, Hood River Counties

Table 6
Occupation Groups 1960, 1965,1970
Area 3

Occupational Group	1960[1]	Percent 1960	1965	Percent 1965	1970	Percent 1970
Professional,Technical,& Kindred	2432	9.0	2900	10.4	3400	11.3
Farmers	2378	8.8	1900	6.8	1500	5.0
Non-farm Managers	2916	10.8	2800	10.0	2900	9.7
Clerical & Kindred	2723	10.1	3100	11.0	3600	12.0
Sales	1586	5.9	1700	6.1	1800	6.0
Craftsmen	3583	13.3	3700	13.2	4000	13.3
Operatives	3530	13.1	3900	13.9	4400	14.7
Private Household	830	3.1	1000	3.6	1200	4.0
Service	2666	9.9	3000	10.7	3400	11.3
Farm Laborers	1937	7.2	1700	6.1	1500	5.0
Non-farm Laborers	1577	5.9	1500	5.4	1500	5.0
Not Reported	786	2.9	800	2.8	800	2.7
Total	26944	100.0	28000	100.0	30000	100.0

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 125, (Special Publication) Labor Force & Employment by SIC Groups and Occupational Groups by Sex, 1960.

Area 3: Wasco, Sherman, Gilliam, Morrow, Umatilla Counties

Table 7
Occupation Groups 1960, 1965, 1970
Area 4

Occupational Group	1960[1]	Percent 1960	1965	Percent 1965	1970	Percent 1970
Professional, Technical& Kindred	5888	9.1	7000	10.3	8100	11.6
Farmers	6636	10.3	5600	8.2	4300	6.2
Non-farm Managers	6514	10.1	6600	9.7	6500	9.3
Clerical & Kindred	6213	9.6	7100	10.4	7800	11.1
Sales	3650	5.7	4100	6.0	4400	6.3
Craftsmen	8059	12.5	8500	12.5	8900	12.7
Operatives	9303	14.5	10200	15.1	11300	16.1
Private Household	1743	2.7	2100	3.1	2500	3.6
Service	5597	8.7	6500	9.6	7100	10.1
Farm Laborers	4748	7.4	4300	6.3	3600	5.1
Non-farm Laborers	4548	7.1	4400	6.5	3900	5.6
Not Reported	1448	2.3	1600	2.3	1600	2.3
Total	64347	100.0	68000	100.0	70000	100.0

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 125, (Special Publication) Labor Force & Employment by SIC Groups and Occupational Groups by Sex, 1960.

Area 4: Wallowa, Union, Baker, Grant, Wheeler, Crook, Jefferson, Deschutes,Klamath, Lake, Harney, Malheur Counties

Table 8
Summary
1960[1]

Occupation	Area A	Area B	Area 1a	Area 1b	Area 2	Area 3	Area 4	Total
Professional,Technical & Kindred	33399	6617	2738	7610	12383	2432	5888	71067
Farmers	4493	1207	1338	2884	6316	2378	6636	25252
Non-farm Managers	27734	5694	3396	8408	8602	2916	6514	63264
Clerical & Kindred	47085	6519	2631	7657	12163	2723	6213	84991
Sales	25293	4271	1818	4858	6818	1586	3650	48294
Craftsmen	37304	8301	3949	11202	11704	3583	8059	84102
Operatives	41489	10355	6216	15434	14640	3530	9303	100967
Private Household	7600	1515	810	2083	2848	830	1743	17429
Service	24413	4867	2603	6692	9147	2666	5597	55985
Farm Laborers	4187	865	1412	2516	4600	1937	4748	20265
Non-farm Laborers	13663	5992	3894	10178	7044	1577	4548	46896
Not Reported	10874	1302	966	2140	2806	786	1448	20322
Total	277534	57505	31771	81662	99071	26944	64347	638834

[1] Source: U.S. Census of Population, 1960, Oregon, Detailed Characteristics, Table 121, adjusted to remove Clark County, Washington

Table 8 (Continued)
Summary
1965

Occupation	Area A	Area B	Area 1a	Area 1b	Area 2	Area 3	Area 4	Total
Professional, Technical & Kindred	42000	9300	3200	9500	16400	2900	7000	90300
Farmers	4000	1200	1100	2400	5800	1900	5600	22000
Non-farm Managers	28000	6600	3300	9100	9600	2800	6600	66000
Clerical & Kindred	57000	8600	3000	9300	15600	3100	7100	103700
Sales	29000	5400	1900	5300	8300	1700	4100	55700
Craftsmen	42000	10300	4100	12400	13900	3700	8500	94900
Operatives	49000	13300	6700	17900	18100	3900	10200	119100
Private Household	9000	1900	1000	2600	3700	1000	2100	21300
Service	30000	6500	2900	8000	11700	3000	6500	68600
Farm Laborers	3000	900	1300	2300	4500	1700	4300	18000
Non-farm Laborers	14000	6600	3600	10000	7500	1500	4400	47600
Not Reported	8000	1400	900	2200	2900	800	1600	17800
Total	315000	72000	33000	91000	118000	28000	68000	725000

Table 8 (Continued)
Summary
1970

Occupation	Area A	Area B	Area 1a	Area 1b	Area 2	Area 3	Area 4	Total
Professional, Technical & Kindred	51000	12100	3800	11900	20600	3400	8100	110900
Farmers	3000	900	800	2000	4700	1500	4300	17200
Non-farm Managers	27000	7100	3200	9200	10000	2900	6500	65900
Clerical & Kindred	67000	10800	3500	11200	18800	3600	7800	122700
Sales	32000	6400	2100	6100	9300	1800	4400	62100
Craftsmen	45000	12100	4300	14000	15700	4000	8900	104000
Operatives	56000	16200	7500	20900	21200	4400	11300	137500
Private Household	11000	2500	1200	3300	4500	1200	2500	26200
Service	34000	8000	3300	9500	14000	3400	7100	79300
Farm Laborers	2000	800	1100	2000	4000	1500	3600	15000
Non-farm Laborers	13000	6700	3300	9800	7300	1500	3900	45500
Not Reported	4000	1400	900	2100	2900	800	1600	13700
Total	345000	85000	35000	102000	133000	30000	70000	800000

CHAPTER IV

THE STRUCTURE OF THE OREGON ECONOMY: AN INPUT/OUTPUT ANALYSIS

by

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THE STRUCTURE OF THE OREGON ECONOMY· AN INPUT/OUTPUT ANALYSIS*

I. INTRODUCTION

Recent econometric analysis of the United States economy has made it possible to conduct preliminary research concerning the structure of the Oregon economy.[1] This monograph is a summary of the highly tentative work which has been initiated under the auspices of the Bureau of Business and Economic Research of the University of Oregon. It is designed primarily to provide a basic and simple explanation of the concepts and techniques underlying a method of analysis which has considerable potential for the study of Oregon's economy, and thereby provide some aid in the resolution of some economic policy questions which confront both the business and the government community.

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Tables 1, 2, 3, and 4 referred to in this chapter will be found in the back of this report in the form of large fold-outs.

[1] Morris R. Goldman, Martin L. Marimont, and Beatrice N. Vaccara, "The Interindustry Structure of the United States: A Report on the 1958 Input-Output Study," Survey of Current Business, Vol. 44, No. 11, November, 1964, pp. 10-29, is the new study which is the basis of this article. This has been supplemented by Wassily Leontief, "The Structure of the U.S. Economy," Scientific American, Vol. 212, No. 4, April, 1965, pp. 25-35. It contains some important and useful supplementary information and modifications. Also see National Economics Division Staff, "The Transactions Table of the 1958 Input-Output Study and Revised Direct and Total Requirements Data," Survey of Current Business, Vol. 45, No. 9, September, 1965, pp. 33-49, 56.

Let it be clear at the outset that the authors do not regard their research either as a complete or a realistic statement of the structure of the Oregon economy. The statistical tables on the following pages barely qualify even as first approximations and are to be regarded as illustrative of a structure which can be determined only by slow, painstaking, and time-consuming research into each of Oregon's industries. No one is more aware of the limitations of the data and of the estimation procedures than are the authors. Uncritical or casual use of these data is not warranted. If one considers the methods, data, and analysis developed in this study as indicative of the results which can be achieved by larger scale research, then the authors believe that this work justifies itself as a first step in a systematic investigation of the structure of the Oregon economy.

The method of analysis explained and employed here is called input/output or interindustry analysis. It was developed during the early 1930's by Professor Wassily W. Leontief of Harvard University as a technique for converting the nonoperational mathematical general equilibrium theory of Leon Walras into a form which could give quantitative answers to quantitative questions about the operations of the economy. The method has received widespread acclaim and use in both business and government in the United

States and in many other countries.[2]

Public and private economic policy can sometimes be significantly improved, as measured by economic efficiency and growth, through the use of quantitative analytical methods, among which the input/output system is one of the most important and generally applicable. It must be clear, however, that such analysis is only an aid in policy formulation, not a substitute. Economic models, such as that discussed below, are designed to indicate the economic consequences or implications of proposed or actual public and private economic decisions; they do not indicate whether or not such decisions should be taken. Knowing the effects of their actions, decision-makers can often improve the quality of their decisions. Public policy formulation is essentially a political process in which economists with their techniques intrude primarily as educators. Input/output and similar methods function most effectively (1) as a research tool, simply to learn more about the economy, and (2) as a source of technical advice to public and private officials who, in the discharge of their responsibilities, need to know more about the economic impact of their actions.[3]

The first three sections of this essay deal with the empirical and theoretical foundations of input/output analysis in general, using the Oregon tables to illustrate the method. Following an explanation of the procedures employed in deriving the Oregon tables, the fifth section discusses some of the quantitative characteristics of the Oregon economy. The next section is deveted to the specific quantitative analysis of particular economic circumstances in Oregon. In the final section the range of applicability and potential uses of input/output are examined.

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[2] See for example, the comments in various national media upon the publication of the 1964 Survey of Current Business study cited earlier, including Time, November 20, 1964, p. 58; Business Week, November 21, 1964, p. 166; Christian Science Monitor, May 4, 1965, p. 5, May 5, 1965, p. 14.

[3] See Robert Loring Allen, "Economics and Public Policy," Oregon Business Review, Vol. XX, No. 6, June, 1961, pp. 1-7, and by the same author, "Do Economists Influence Policy," Challenge, Vol. 10, No. 4, January, 1962, pp. 6-9.

II. INPUT/OUTPUT ACCOUNTING

Input/output methods can be viewed in two ways: accounts and analysis. Viewed in the first way, the input/output accounts are simply a systematic double-entry accounting system for the economy as a whole. Analysis consists of the use of these accounts to determine the impact of specified changes in the economy. Tables 1 and 2 are a statistical summary of the input/output accounts of the state of Oregon and are the point of departure for describing as well as analyzing its economic structure.

Any economic system, be it that of a nation, state, or region, consists of natural and human resources organized into an institutional framework for the purpose of producing economic goods and services. Production within the economy is initiated and maintained by virtue of the demands of decision-making units, including consumers, enterprises, investors, and the government. These demands are for the production of specific amounts and kinds of goods and services, produced in such a way that the allocation of resources, the amounts and kinds of goods and services produced, and the valuation or price schema, are all simultaneously determined. In the course of the functioning of the economy, the industries which control certain resources are called upon to release some of them to those industries which will use these resources to produce other goods and services or which will use them as final products. Thus, the process of production requires a great many transfers of resources or inputs and outputs. These transfers can be called transactions. Input/output accounting is simply a reflection of the real system of transactions which actually takes place among the firms of the various sectors of the economy during any given time period, usually a year.

Before input/output accounting can have any meaning, it is necessary to have a self-contained, mutually-exclusive classification system of all economic activities. Otherwise, there is no way to be certain that all transactions are properly recorded and classified or that the same transaction is counted no more than once. With the economy divided into sectors or industries, it is possible to begin the process of input/output accounting. The classification system in the stub of Table 1 is such a system. It is based upon that employed by the Department of Commerce study.[4]

All of the transactions within the economy during a given year can be grouped together in accordance with the classification system in Table 1. Each transaction of a firm in the Livestock and Products industry which makes a sale to a firm in Food and Kindred Products can be tabulated and recorded in the appropriate box in the table. Note that each transaction is simultaneously a purchase and a sale. It is a sale when it is viewed as a transfer of a good by one sector to another sector. In is a purchase when viewed as the acquisition or purchase of a good by one sector from another.

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[4] The industrial classification used by The Department of Commerce and in this study is from the Standard Industrial Classification Manual--1957, U.S. Bureau of the Budget, Washington, D.C., 1957.

Livestock and Products in Oregon, for example, has a total output of about $300 million. A part of this is a sale right back to the same industry. In terms of equation (1) below, this is x_{11} and amounts to $47.6 million. A part of the output is also sold to Food and Kindred Products, about $211.5 million. This is x_{15}. The top row in Tables 1 and 2 and the top row in equation (1) are the same, a description of how the output of Livestock and Products is distributed among other sectors of the economy and among final users. If one adds up all of the cells in row 1, or in any row, except the last entry, the sum will necessarily equal the last entry, which is total output.

$$
\begin{array}{l}
x_{11} + x_{12} + x_{13} + x_{14} + \ldots + x_{1n} + Y_{1C} + Y_{1I} + Y_{1G} + Y_{1E} = X_1 \\
x_{21} + x_{22} + x_{23} + x_{24} + \ldots + x_{2n} + Y_{2C} + Y_{2I} + Y_{2G} + Y_{2E} = X_2 \\
x_{31} + x_{32} + x_{33} + x_{34} + \ldots + x_{3n} + Y_{3C} + Y_{3I} + Y_{3G} + Y_{3E} = X_3 \\
x_{41} + x_{42} + x_{43} + x_{44} + \ldots + x_{4n} + Y_{4C} + Y_{4I} + Y_{4G} + Y_{4E} = X_4 \\
\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
x_{n1} + x_{n2} + x_{n3} + x_{n4} + \ldots + x_{nn} + Y_{nC} + Y_{nI} + Y_{nG} + Y_{nE} = X_n \\
x_{f1} + x_{f2} + x_{f3} + x_{f4} + \ldots + x_{fn} + Y_{fC} + Y_{fI} + Y_{fG} + Y_{fE} = X_f
\end{array} \tag{1}
$$

There are four elements in each row which require explanation. Each is denoted by a Y. These elements are recorded in Table 2. Y_{1C} is the amount of output of industry 1 which is used for personal consumption. Y_{1I} is the amount of output of industry 1 which is used for investment purposes. Y_{1G} is the amount of output of industry 1 which is used by the government. Y_{1E} is the external trade balance, that is, exports outside the economy minus imports from outside the economy. Bear in mind that this transaction may include some of the industry's products destined for other industries but outside the political jurisdiction of this economy. It may also include some industry 1 output imported from another region and used in this region. Because these imports are negative, the amounts of industry 1 used by this economy's industries are counted as positive where they are used and then are subtracted by a negative entry in Y_{1E}.

The total of the four, which can be called Y_1, is the amount of industry output which is for final use and represents the amount of that product available for final consumption by the economy. The sum of Y_1, Y_2, Y_3, Y_4, . . . , Y_n is the gross domestic product of the state's economy and corresponds to Gross National Product for the nation's economy. That part of output which is not sold to final demand is sold to other industries who use it as an input for further production. For example, Livestock and Products sells only about $30 million to personal consumption and the industry imports $25 million. But of the $211.6 million which is sold to Food and Kindred Products, much is subsequently sold to final demand. For example, Food and Kindred Products sells $700 million of its $920 million output to final demand. This is simply a reflection of the fact that producers of Livestock and Products sell to meat processors and packers who, in effect, make another product of it, and sell that product to consumers. Thus, there is considerable double counting in the input/output table as a whole, reflecting sale, transformation of the product, and resale. Gross domestic output, that is, the sum of the final demands, measures only that which is actually produced for final use. The larger figure, total output (the sum of X_1, X_2, X_3, X_4, . . . , X_n), also measures that which is used up in the production process, whether produced domestically or imported.

It is also to be noted that in equation (1) there is a special row, or industry, denoted as industry f. It is a representation of the basic factors of production, land, labor, capital, and entrepreneurship and is called value added in Tables 1 and 2. All of the industries 1 through n are intermediate industries, while industry f consists of the primary inputs. The amount of sales of industry f to an industry is a measure of the value added (the total of wages, rent, interest, and profits) by that sector, inasmuch as all of the other sales to the industry are used in further processing. The sum of the value added for all industries and the sum of the sales to final demand by each industry are the same figure, the gross domestic product of the economy.

The input/output accounts can be examined from two points of view. By looking across the rows in Tables 1 and 2 (or equation (1)) the distribution pattern of a specific producing industry is evident, as explained earlier. Table 1 shows the interindustrial distribution; Table 2 shows the final demand distribution. A column in Table 1 displays the input pattern, or the sector of origin of all of the inputs of a specific consuming industry. Take any particular industry and run your eye across the row: this is how the firms in that industry market their products. Now, scan the same industry's column: this is a listing of the industries from which this industry must buy in order to produce its products.

There are, in effect, five components in Tables 1 and 2 (or equation (1)). The first component is the last column, the schedule of total outputs (X_1, X_2, X_3, X_4, . . . , X_n). The second consists of the four final demand sectors (Y_C, Y_I, Y_G, and Y_E) all which are in Table 2. The third is the interindustry flow system (the x_{ij}'s, where i is the producing industry and j is the consuming industry), which constitutes the bulk of Table 1 and which describes the amount which one industry uses of the output of another industry. The fourth part, recorded in both tables, is the value added row, the amounts of prime inputs used by each industry. Finally, in Table 2 there is the sum of the bottom row and the final demand columns. These are control totals to assure that the product accounts, recorded (1) by use and (2) by factor contribution, balance exactly.[5]

The external trade characteristics of the input/output flow table must be emphasized. Imports and exports are, of course, included in the flow table, but in a special place, in final demand. All exports by each industry are placed in a special cell in Table 2, even though the export may be an input for a processing sector in another state or region. Imports on the other hand, are included in the flow system; that is to say, the purchase of Livestock and Products by Food and Kindred Products (Row 5, Column 1, Table 1) may include imported livestock. These imports, scattered as they are throughout Table 1, are taken out by subtracting the total of imports from exports in final demand (in Table 2). If imports exceed exports for, say, industry 1, then the number in that cell, Y_{1E}, is negative.

A complete double-entry accounting for the economy as a whole is the result of the process outlined above. This is precisely what input/output accounts are. Tables 1 and 2 can be viewed as a complete statistical description of the operations of the Oregon economy for 1963. These types of tables are usually called input/output transactions or flow tables. They are, of course, a highly simplified view of the economy, since thousands of firms are grouped together into only 29 industries and four final demand sectors. But this high degree of aggregation has the virtue of enabling one to see, in a simple tabulation, the entire scope of the economy.

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[5] Input/output accounts are entirely conformable with the national account system of the United States and indeed can be regarded as simply an amplification of these accounts to take into consideration intermediate transactions. See Richard Stone, Input-Output and National Accounts, Organization for European Economic Co-operation, Paris, 1959.

III. INPUT/OUTPUT ANALYTICAL PROCEDURES

The analysis of the economic system employs the input/output accounts as the essential factual ingredient. For a portion of the economy, a unique relationship is defined between the amount of input used and the amount of output produced. This is called the technical or input coefficient. Such technical coefficients are defined, however, only for the interindustrial portion of the accounts, that is, for the regular producing and consuming sectors in Table 1. No such coefficients are employed for the final demand or value added sectors. Thus,

$$\begin{array}{ll}
(2) & a_{11} = \frac{x_{11}}{X_1},\ a_{12} = \frac{x_{12}}{X_2},\ a_{13} = \frac{x_{13}}{X_3},\ a_{14} = \frac{x_{14}}{X_4},\ \ldots,\ a_{1n} = \frac{x_{1n}}{X_n} \\
 & a_{21} = \frac{x_{21}}{X_1},\ a_{22} = \frac{x_{22}}{X_2},\ a_{23} = \frac{x_{23}}{X_3},\ a_{24} = \frac{x_{24}}{X_4},\ \ldots,\ a_{2n} = \frac{x_{2n}}{X_n} \\
 & a_{31} = \frac{x_{31}}{X_1},\ a_{32} = \frac{x_{32}}{X_2},\ a_{33} = \frac{x_{33}}{X_3},\ a_{34} = \frac{x_{34}}{X_4},\ \ldots,\ a_{3n} = \frac{x_{3n}}{X_n} \\
 & a_{41} = \frac{x_{41}}{X_1},\ a_{42} = \frac{x_{42}}{X_2},\ a_{43} = \frac{x_{43}}{X_3},\ a_{44} = \frac{x_{44}}{X_4},\ \ldots,\ a_{4n} = \frac{x_{4n}}{X_n} \\
 & \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\
 & a_{n1} = \frac{x_{n1}}{X_1},\ a_{n2} = \frac{x_{n2}}{X_2},\ a_{n3} = \frac{x_{n3}}{X_3},\ a_{n4} = \frac{x_{n4}}{X_4},\ \ldots,\ a_{nn} = \frac{x_{nn}}{X_n}
\end{array}$$

For purposes of analysis, within the framework of the data presented in Table 1 (and equation (1)), it is necessary to assume that the technical coefficients, the a's in equation (2), are technologically determined and fixed. What this assumption means is that, regardless of the level of output or other factors, such as changes in prices or relative prices of inputs, the sector requires a specific amount, indicated by a_{ij} for each unit of output of industry j. This is not necessarily true in all cases. Economists and engineers recognize that there are scale economies with respect to some inputs, implying that some of the a's would decline at higher output levels. In other cases, a higher relative price for an input will tend to discourage its use and tend to encourage the use of some other input.[6]

As a computational and analytical convenience the assumption of fixed coefficients is probably not too unrealistic if the postulated changes are relatively small and the time period of analysis is relatively short. Table 3 embodies the technical coefficients for the Oregon economy. The simplest way to view the computation of Table 3 is to consider that each column in Table 1 is divided by the corresponding total output of that industry. Thus, converted to percentages, each column must add to 100 per cent.

The reason for including imports in the interindustrial transactions (and subtracting them in final demand) now becomes apparent. If imports had been left out, the coefficients would have reflected only the relationship between domestic inputs and output, that is, only a part of the required input per unit of output. By including imports, a purely technical coefficient has been defined, relating inputs, whatever their origin, to outputs. The coefficients do not reflect the structure of Oregon imports in any given year, but rather the techniques of production of each industry.

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[6] Economic theory does not characteristically assume constant technical coefficients but rather a functional relationship in which equilibrium demand for inputs is related to scale and input prices, as well as other factors. See James N. Henderson and Richard E. Quandt, Microeconomic Theory, McGraw-Hill, New York, 1958, pp. 42-84.

Conceptually, it is not necessary to assume that the technical coefficients are fixed. If the input/output accounts provide evidence of scale economies, or if other economic or engineering data are used which show systematic variation for some or all of the coefficients, it is a simple matter to employ these data. The computational procedures are slightly more complicated because of the greater detail, but the economic processes involved and their interpretation are straightforward.

Equation (2) can be substituted into equation (1) and equation (3) results. It is to be noted that (3) has been organized differently, the four final demand columns have been collapsed into one column, and the value added row has been omitted. It remains, however, a restatement of equation (1), the basic input/output accounts equation, except that now the technical coefficients are explicit. There is no table to correspond exactly to equation (3), but it can be regarded as a juxtaposition of the coefficients in Table 3, and the sum of final demands, and the total output in Table 1. Equation (3) thus relates the total output of each industry to the total output of every other industry, as modified by the technical coefficients, and to final demand.

$$
\begin{aligned}
(3)\quad & X_1 - a_{11}X_1 - a_{12}X_2 - a_{13}X_3 - a_{14}X_4 - \ldots\ldots - a_{1n}X_n = Y_1 \\
& X_2 - a_{21}X_1 - a_{22}X_2 - a_{23}X_3 - a_{24}X_4 - \ldots\ldots - a_{2n}X_n = Y_2 \\
& X_3 - a_{31}X_1 - a_{32}X_2 - a_{33}X_3 - a_{34}X_4 - \ldots\ldots - a_{3n}X_n = Y_3 \\
& X_4 - a_{41}X_1 - a_{42}X_2 - a_{43}X_3 - a_{44}X_4 - \ldots\ldots - a_{4n}X_n = Y_4 \\
& \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
& X_n - a_{n1}X_1 - a_{n2}X_2 - a_{n3}X_3 - a_{n4}X_4 - \ldots\ldots - a_{nn}X_n = Y_n
\end{aligned}
$$

Equation (3) thus sets up the analytical problem, but it is an awkward system of n equations. By employing a simpler notation, that of matrix algebra, the problem and its solution can be seen more clearly. For example, the whole schedule of total outputs, that is, the final column in Table 1, can be set equal to X and the sum of each industry's final demand, that is, the sum of the final demand columns in Table 2, can be set equal to Y. Thus,

$$
\begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \\ \text{---} \\ X_n \end{bmatrix} = X \text{ and }
\begin{bmatrix} Y_{1C} \\ Y_{2C} \\ Y_{3C} \\ Y_{4C} \\ \text{---} \\ Y_{nC} \end{bmatrix} +
\begin{bmatrix} Y_{1I} \\ Y_{2I} \\ Y_{3I} \\ Y_{4I} \\ \text{---} \\ Y_{nI} \end{bmatrix} +
\begin{bmatrix} Y_{1G} \\ Y_{2G} \\ Y_{3G} \\ Y_{4G} \\ \text{---} \\ Y_{nG} \end{bmatrix} +
\begin{bmatrix} Y_{1E} \\ Y_{2E} \\ Y_{3E} \\ Y_{4E} \\ \text{---} \\ Y_{nE} \end{bmatrix} =
\begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \\ Y_4 \\ \text{---} \\ Y_n \end{bmatrix} = Y
$$

In addition, the technical input/output coefficients in equations (2) and (3) may be rewritten as follows and set equal to a, which is shown in Table 2.

$$\begin{bmatrix} a_{11}, & a_{12}, & a_{13}, & a_{14}, & \cdots, & a_{1n} \\ a_{21}, & a_{22}, & a_{23}, & a_{24}, & \cdots, & a_{2n} \\ a_{31}, & a_{32}, & a_{33}, & a_{34}, & \cdots, & a_{3n} \\ a_{41}, & a_{42}, & a_{43}, & a_{44}, & \cdots, & a_{4n} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ a_{n1}, & a_{n2}, & a_{n3}, & a_{n4}, & \cdots, & a_{nn} \end{bmatrix} = a$$

Now, equation (3) may be rewritten in much simpler form:

$$(4) \quad X - aX = Y$$

The ambiguity of having two X's can be taken care of by restating this:

$$(5) \quad X\,(I - a) = Y$$

The new element, I, is simply a different way of writing (1), as follows:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & \cdots & 0 \\ 0 & 1 & 0 & 0 & \cdots & 0 \\ 0 & 0 & 1 & 0 & \cdots & 0 \\ 0 & 0 & 0 & 1 & \cdots & 0 \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ 0 & 0 & 0 & 0 & \cdots & 1 \end{bmatrix} = I$$

Equation 5 is still not the solution, but it has some interesting properties which can reveal a great deal about the economy. For example, if, as a matter of public policy, it is decided that certain output levels are required, then it is possible to compute the level of deliveries to final demand implied in that schedule of outputs. Alternatively, if it is known or can be estimated that outputs will grow to specific higher levels in a given period of time, the amounts of all industries' outputs which will be available to consumers, investors, and the government can be computed. Let X' be the new schedule of outputs which are required or estimated. Then,

$$(5a) \quad X' (I - a) = Y'$$

where Y' is the new final demand given the new output levels.

Another computation which can be made is to determine the impact of technological change on final demand delivery. Suppose that during the same time period under review as above, it is known or can be estimated that certain technical coefficients will change. These can be substituted into a, converting it into a'. Thus,

$$(5b) \quad X' (I - a') = Y''$$

where Y'' is the new schedule of deliveries to final demand combining both the estimated new outputs and new technical coefficients. This analysis, it is to be noted, can be performed with the data in Table 3. Ordinarily, computing machinery is desirable, but the Oregon table is sufficiently small that the operations of this type can be done with an ordinary desk calculating machine. The full computational instructions for equation (5) are as follows:

$$\begin{array}{ll}
(6) & (1 - a_{11}) X_1 - a_{12}X_2 - a_{13}X_3 - a_{14}X_4 - \cdot \cdot \cdot \cdot - a_{1n}X_n = Y_1 \\
 & - a_{21}X_1 + (1 - a_{22}) X_2 - a_{23}X_3 - a_{24}X_4 - \cdot \cdot \cdot - a_{2n}X_n = Y_2 \\
 & - a_{31}X_1 - a_{32}X_2 + (1 - a_{33}) X_3 - a_{34}X_4 - \cdot \cdot \cdot - a_{3n}X_n = Y_3 \\
 & - a_{41}X_1 - a_{42}X_2 - a_{43}X_3 + (1 - a_{44}) X_4 - \cdot \cdot \cdot - a_{4n}X_n = Y_4 \\
 & \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \\
 & - a_{n1}X_1 - a_{n2}X_2 - a_{n3}X_3 - a_{n4}X_4 - \cdot \cdot \cdot + (1 - a_{nn}) X_n = Y_n
\end{array}$$

The possibilities for analysis, however, are by no means exhausted by these examples. Equation (5) can be turned the other way around, that is, solved for X in terms of Y. It would then read:

$$(7) \quad X = \frac{1}{(I - a)} Y = (I - a)^{-1} Y$$

It must be remembered that the I and a are not simple numbers but rather large sets of numbers (called matrices) and determining their reciprocal is no easy matter. Perhaps the $(I - a)^{-1}$ could be determined with pencil and paper or with a desk calculator for a 9 x 9 or a 16 x 16 or even a 25 x 25 matrix, but soon it is necessary to resort to computing machinery to determine the answer. This is what the authors did, using the IBM Model 1620 at the Statistical Laboratory and Computing Center of the University of Oregon. The results are shown in Table 4.[7] It is called an inverse matrix since the calculation to obtain it is called the inversion of the matrix of technical coefficients.

Equation (7) can be simplified even further; thus,

$$(7a) \quad X = AY$$

where $(I - a)^{-1}$ is equal to A, which is the inverse matrix.

Whereas before the analytical procedure was to specify X (total output) and to calculate the Y (final demand), it is now possible to specify the Y (final demand) and calculate the X (total output). The kind of question that can be asked now is of the following type: Suppose that the demands of consumers, investors, or government were different from what they are or that there was a change in the value of imports or exports. What is the schedule of output which conforms to that new final demand? Suppose it is estimated that consumer demand (or the demand of investors or government) were to increase. What impact will this have on final demand? In other words, given final demand and the technical conditions of production, what outputs are necessary?

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[7] The computations in this study were made at the Computing Center with the assistance of Professor George Struble of the Mathematics Department. Mr. James O'Brien assisted with the earlier work of computing the dollar flow table and the coefficient table.

To determine such an impact of a change in final demand, it is first necessary to specify a new schedule of such demands, be they estimated, projected, predicted, simply postulated, or required. It can be called Y*. Then,

$$\text{(7b)} \quad X^* = AY^*$$

where X* are the new outputs required by the new final demand. As in the previous case, the impact of a change in the technical coefficients can also be examined. Suppose some of the coefficients were changed. It would be necessary to go back to the computer and get a new A, which can be denoted A*. Then,

$$\text{(7c)} \quad X^{**} = A^* Y^*$$

where X** indicates the change in output levels occasioned both by the change in technical coefficients and by the change in final demand.

In order to obtain these last results, a desk calculator is often all that is needed, depending upon the number of industries. The full computational instructions for determining the impact in final demand are as follows:

$$
\begin{aligned}
(8)\qquad X_1 &= A_{11}Y_1 + A_{12}Y_2 + A_{13}Y_3 + A_{14}Y_4 + \ldots + A_{1n}Y_n \\
X_2 &= A_{21}Y_1 + A_{22}Y_2 + A_{23}Y_3 + A_{24}Y_4 + \ldots + A_{2n}Y_n \\
X_3 &= A_{31}Y_1 + A_{32}Y_2 + A_{33}Y_3 + A_{34}Y_4 + \ldots + A_{3n}Y_n \\
X_4 &= A_{41}Y_1 + A_{42}Y_2 + A_{43}Y_3 + A_{44}Y_4 + \ldots + A_{4n}Y_n \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
X_n &= A_{n1}Y_1 + A_{n2}Y_2 + A_{n3}Y_3 + A_{n4}Y_4 + \ldots + A_{nn}Y_n
\end{aligned}
$$

This tedious step-by-step derivation of the solution of an input/output system is justified on grounds that it is necessary to demonstrate its logic with some degree of rigor. Given the validity of its assumptions and accurate data, the method of input/output will produce accurate and precise quantitative results. Only by discussing each of the components of the system and its role in the solution can the limitations of the Oregon study be fully appreciated.

The input/output accounting system and the analysis outlined above is only one of many possible frameworks for this kind of analysis. With different kinds of data which are differently arranged, a different analytical procedure is involved, making it possible to answer other types of questions. Some of the other modes of analysis may involve prices, capital flows, inventories, and interregional flows. In all cases, however, the analytical procedure will involve equations like equations (5) and (7), that is, given a technical structure and some element of the economy, it is possible to compute the implied other element of the system.[8]

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[8] For those interested in pursuing the conceptual aspects of the system and the analytical procedures, see the works of Leontief listed in the bibliography at the end as well as Hollis B. Chenery and Paul G. Clark, Interindustry Economics, Wiley and Sons, 1959.

IV. ECONOMIC INTERPRETATION

The emphasis in the last section was upon the essential logic of the input/output system, without any particular effort to interpret, in economic terms, the meaning of the solution. Some of this economic interpretation is relatively easy and requires no explicit statement. It is nonetheless useful to trace out the basic economic meaning of some aspects of the system, particularly equations (6) and (8), the coefficients of which are given in Tables 3 and 4. In a later section the economics of the input/output system will become even clearer through the use of illustrative quantitative cases involving problems facing the Oregon economy.

Suppose there exists a concrete situation in which it is estimated that the total output for some or all of the industries will increase. That is, $X_1{}^1 \geq X_1$; $X_2{}^1 \geq X_2$; $X_3{}^1 \geq X_3$; $X_4{}^1 \geq X_4$; . . . ; $X_n{}^1 \geq X_n$. What is desired are the values of deliveries to final demand ($Y_1{}^1$, $Y_2{}^1$, $Y_3{}^1$, $Y_4{}^1$, . . ., $Y_n{}^1$) which are consistent with the $X_1{}^1$. The formal method is, of course, simply to substitute each X^1 into equation (6) and to calculate each new Y^1, using the numerical coefficients, a, to determine the new values. But what does this mean in economic terms?

Bear in mind the origin of equation (6). It is based on the proposition that the output of each industry, say industry 1, is used, in its entirety, by other industries and by final demand. Now as the output of all industries increases, then the demands of those industries for the output of industry 1 will increase. The amount of the increased demand is indicated precisely by the amount of industry 1 output which is used by each other industry , or a_{1j}, where j is all industries from 1 to n. Thus, the amount of industry 1 output available to final demand (Y_1^1) will be the new output (X_1^1) minus the amount by which industry 1 output has gone up times the amount industry 1 needs per unit of output of industry 1, minus the amount industry 2 increases times the amount of industry 1 output needed per unit output of industry 2, . . ., minus the amount that industry n increases times the amount of industry 1 output required per unit output of industry n. In other words, when the outputs of all industries increase, each makes greater demands on industry 1, and these new demands must be subtracted from the new output level of industry 1 in order to determine how much is left over for use by final demand. The same reasoning applies for all other industries.

Somewhat more complicated reasoning, however, is involved if a change in final demand is estimated and its impact on the output of all of the industries of the economy is desired. It will be remembered that final demand is only a part of the output of each industry and is not included in the system of equations. That is, it is a force acting on the economy by decisions of consumers, investors, and government not related to the technical structure of the economy. Even so, the same sort of calculation is required to obtain the impact, as is indicated by equation (8). In this case, however, the coefficients, the A's this time, have a different meaning. Examine, for example, corresponding coefficients in Tables 2 and 3. In every case the inverted technical coefficient in Table 4 is larger than the corresponding coefficient in Table 3. Note too that there are no zeros in Table 4, whereas there are a few in Table 3.

The reason that these coefficients are larger is that when the independent decision affecting final demand is made, an economic process is initiated which affects all industries in the economy. The A coefficients are a summary and a reflection of this process. Suppose that the government's demand for the products of just one industry, say industry 1, increases. As a direct result, the output of industry 1 rises by the same amount that the government orders did. But as the output of industry 1 goes up, it will demand more inputs, in accordance with the technical coefficients in equation (6) (Table 3).

Suppose, for simplicity, there were only two such suppliers, industries 2 and 3, to the original expanding industry. Their outputs will rise by an amount determined by the rise in industry 1's output multiplied by the technical coefficients tying industry 1 to industries 2 and 3. Now, the output of industry 2 has risen and it demands more inputs, say from industries 4 and 5, and the output of industry 3 has risen and it will demand more inputs, say from industries 6 and 7. Industries 4, 5, 6, and 7 demand more inputs from still other industries and perhaps from some of the industries already mentioned.

The process of economic expansion continues but gradually loses strength since in each case the expansion of an industry's output occasions only a small expansion in its demand for inputs (and hence the output expansion of the input supplying industries). The effect is not a little unlike tossing a rock in the pond; the impact is greatest at the epicenter and dwindles by distance from it. Eventually the impact becomes so attenuated that it is negligible.

The coefficients A (Table 4) wrap up all of the direct effects and all of the indirect effects of a change in final demand in one number. The a matrix (Table 3) is the basis of A matrix (Table 4) and the difference between them is a reflection of all of the indirect effects. There will always be some indirect effects, however weak, so long as there are any interrelationships among the industries in the economy. Note that a change in the final demand of a single sector changes all outputs, not just the industry where the change occurred alone. When final demand of two or more industries is changed, then the direct and indirect effects of each change on each industry are simply added together.

V. THE OREGON STUDY

With modern computational machinery the task of numerical analysis is relatively easy and rapid. The economic interpretation of the results of research requires considerable effort. But the most difficult and time-consuming task is that of assembling the basic data in an input/output system, such as that embodied in Tables 1 and 2. Every row and every column can consume thousands of man-hours of research. Every industry is more than a PhD thesis, with dozens more on value added, final demand, and reconciling and balancing the table.

While the first input/output transactions tables were constructed by Professor Leontief himself, it quickly became apparent that the data demands were so immense that only a large research agency with access to data available usually only to governments was capable of undertaking major research in the field. In the early postwar period

Leontief organized his now famous Harvard Economic Research Project, many other university and private research projects were launched, and various nations began to experiment with the technique.[9]

The United States government was among the first to adopt the technique with a major study of United States economic structure. An input/output study was used during the second World War in connection with the allocation of critical materials. Later, another study was based upon the Census of Manufactures of 1947 (it is virtually necessary to use basic Census data) and undertaken largely by the Bureau of Labor Statistics with the cooperation of many governmental and private agencies. Some of the results of this $1.5 million research project and the detailed industry studies are available.[10]

The 1947 study was employed in analyzing the partially-mobilized United States economy during the Korean hostilities, but the results of this work have never been published. At an increasing rate, foreign governments began to employ input/output analysis, sometimes in a central way, in economic policy decisions. Among the countries which have official programs are: The Netherlands, Norway, Great

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[9] There are two comprehensive bibliographies of input/output studies to date, covering from the beginning to the end of 1960. They are Vera Riley and Robert Loring Allen, Interindustry Economic Studies, Johns Hopkins, 1955, and Charlotte Taskier, Input-Output Bibliography, 1955-1960, United Nations, 1961. The literature seems to increase exponentially.

[10] W. Duane Evans and Marvin Hoffenberg, "The Interindustry Relations Study for 1947," Review of Economics and Statistics, Vol. 34, No. 2, May, 1952, pp. 97-142.

Britain, Israel, Argentina, the Soviet Union, several East European countries, and many other developed as well as less developed countries. In 1964 each of the six countries of the European Economic Community published identical and coordinated input/output studies.

The United States government, however, lost interest in 1953 and it was not until 1959 that this interest was renewed by the establishment of a research and data-gathering unit, the National Economics Division, in the Office of Business Economics of the Department of Commerce. This Division, which is parallel to the National Income Division which keeps the United States Gross National Product accounts, is charged with continuing studies of economic and industrial structure in this country. For the last several years the Division has been examining the structure of the United States economy in 1958 (there was a Census of Manufactures in that year). The first results were published in the Survey of Current Business of November, 1964.

It is a study of 86 economic sectors and 9 final demand categories and includes tables corresponding to Tables 3 and 4 in this article. It is undoubtedly the most detailed and reliable study of the structure of the United States economy yet undertaken. Forthcoming Surveys[11] will have additional details on the 1958 study and the Division is now beginning work on a study of the structure of the United States economy in 1962.

Until this year no systematic study of the structure of the

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[11] See Norman Frumkin, "Construction Activity in the 1958 Input-Output Study," Survey of Current Business, Vol. 45, No. 5, May, 1965, pp. 13-24; and National Economics Division Staff, "The Transactions Table of the 1958 Input-Output Study...," op. cit.

Oregon economy had been undertaken. Many studies have examined particular industries and facets of the Oregon economy, but not within an input/output framework. And even this present study is synthetic, in the sense that it relies heavily upon the United States 1958 study for a crucial piece of information, the technical structure of the Oregon economy. The Harvard Economic Research Project revised the Department of Commerce work slightly, particularly in the treatment of foreign trade, and provided the United States control totals, that is, the total outputs of all industries. Thus, Tables 1, 2, and 3 are based on HERP's work, which in turn is based on Department of Commerce work.

The procedure used in obtaining the Oregon tables can be indicated as follows:

Step 1: Independent estimates of the Oregon output of 81 Department of Commerce producing and consuming sectors.

Step 2: Aggregation of Step 1 into 29 sectors according to the classification system in Table 1.

Step 3: Independent estimates of Oregon domestic final demand in three categories: (1) personal consumption, (2) investment, including construction, and (3) government.

Step 4: Aggregation of Step 3 into 29 sectors.

Step 5: Multiplication of each output in Step 1 by its corresponding column in the coefficient table in the Leontief article in the Scientific American, April, 1965.

Step 6: Suppression of noncompetitive import flows by adding to the intra-industry transaction for each industry.

Step 7: Aggregation of the 81 by 81 Oregon transactions table determined in Steps 5 and 6 into a 29 by 29 Oregon transaction table.

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Step 8: Independent estimates of known structural characteristics of Oregon's economy to modify Step 7.

Step 9: Independent and derived estimates of Oregon net trade balance and Oregon total final demand, by sector.

Step 10: Independent and derived estimates of Oregon value added, by sector.

Step 11: Reconciling and balancing estimates of Steps 7, 8, 9, 10, resulting in Tables 1 and 2.

Step 12: Division of each entry in each column of Step 11 (Table 1) by its corresponding output, as determined in Step 2, resulting in Table 3.

Step 13: Subtraction of Step 12 (Table 3) from an identity matrix of the same size.

Step 14: Inversion of Step 13, resulting in Table 4.

It is clear from this description that two essentially different sets of information were involved in the procedure. Steps 1, 2, 3, and 4 and parts of 8, 9, and 10 are data concerning the Oregon economy and are based upon output and employment data available in a variety of published sources.[12] Step 5, on the other hand, involves the use of the description of United States industrial structure, based on the Department of Commerce study of 1958 industrial structure for the country as a whole. The result is, of course, an amalgam of data of both the United States and the Oregon economy. This mixture of data constitutes the chief weakness of the Oregon study. Information concerning the United States industrial structure was used because corresponding data for the economy of Oregon simply does not exist at this time.

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[12] Among the sources were: *Oregon Economic Statistics, 1964*, Bureau of Business and Economic Research, University of Oregon; *Oregon Covered Employment and Payrolls*, Department of Employment, State of Oregon; *Facts and Figures*, 13th edition, Tax Foundation, 1965; *Statistical Yearbook of the Electrical Utilities Industry*, Edison Electrical Institute; *Survey of Current Business*, U.S. Department of Commerce.

It is well to be completely certain what is and what is not implied in the procedure outlined above. For example, it is not implied that the Oregon economy is simply a small-scale replica of the United States economy. That this proposition is not so is assured by Steps 1 and 3 which are independent estimates of output and final use, by category, in the Oregon economy. For example, while Lumber and Wood Products is only a little more than 1 per cent of United States total production, it is nearly 9 per cent of the Oregon economy. On the other hand, while machinery is .46 per cent of the Oregon economy, it is [illegible].5 per cent of the United States economy. In addition, the relative amounts going to consumption, investment, and government, by sector, are different for the United States and Oregon economies. Thus, it is the Oregon economy and the Oregon product mix which is exposed in the tables.

On the other hand, it is the United States industrial structure, or input/output system, which was employed in building the tables. The input per unit output coefficients for the United States in 1958 were the ones used for each of the 81 industries in the Oregon economy. It was the magnitude of output of Oregon industry to which the United States coefficients were applied. What this means is that the technical structure of the Oregon economy is assumed to be identical with that of the United States generally in an 81 industry classification system. In other words, Oregon produces Lumber and

Wood Products except containers and wooden containers, Stone and Clay Products, Glass and Glass Products and all other items in the same way as it is done in the national economy for 81 industries. For the 29 industries shown in the tables, this is not so. The Oregon output of each of the 81 industries alters the relative quantitative importance, so that Lumber and Wood Products (Industry 7 in Table 3) is an Oregon weighted set of coefficients.

The fact is that the Oregon economic structure is almost certainly different from that of the United States economy. Economic structure, reflected by the input/output coefficients, is related to technology as a whole as well as particular techniques of production; to the relative prices of particular inputs, and especially to relative capital and labor costs reflecting the basic resource endowment; to the amounts of capital; to peculiarities of the transport network; to the market structure; as well as to many other factors. It is too much to expect that the Oregon economy is identical to that of the United States economy in all these aspects.

The use of United States economic structure in connection with the Oregon economy must be regarded as a feeble first approximation. The authors have made a modest attempt to modify the United States structure with some known characteristics of the Oregon economy. Little research, however, has been done on this subject. In this experimental study the authors decided to go ahead and use the United States coefficients for the most part with the hope that the results would not be misunderstood and the expectation that further research will provide better estimates of Oregon economic structure.

The inadequacies of basic data and the estimating procedures employed in this study are not, however, a reason for throwing up one's hands and declaiming on the uselessness of the technique because everything is not as it should be. In fact, in the view of the authors, data deficiency and poor estimating techniques are a challenge which must be overcome by large-scale systematic research into the basic characteristics of the Oregon economy. The method is valid and useful, as is pointed out step by step in previous sections and in the illustrations of use in a section which follows this. It is the economic scientist's task to obtain more observations and more accurate observations in order to make his work as useful as possible for those in positions of public and private economic responsibility.

VI. OREGON ECONOMIC STRUCTURE

Before examining the impact on the Oregon economy of some specific conditions, it is desirable to comment on the Oregon economic structure which is depicted in Tables 1, 2, and 3. Bear in mind the procedure by which these tables were constructed. Oregon output totals were estimated and multiplied by the United States technical coefficients to determine Oregon interindustry flows. The latter were summed to determine the interindustrial or intermediate demand. These estimates, along with estimates of Oregon domestic final demand and Oregon total output, were employed to estimate the net trade balance for each sector.

The output mix of the Oregon economy is, of course, significantly different from that of the United States. This is most obvious in comparing the output of individual industries in Oregon with the corresponding output in the United States. The gross domestic product of Oregon is about 1 per cent of that of the country, but Oregon has that same share for only a few industries. For example, this is nearly true of Food and Kindred Products and a variety of service industries. In most other industries, Oregon has either a larger or smaller share of United States output. Paper and Allied Products in Oregon, for example, is almost 6 per cent of United States output and 5 per cent for Lumber and Wood Products. For other industries, Oregon has a very small share; it has no tobacco, no ordnance, and very little of several categories of machinery, manufacturing, and other finished products.

On the other hand, despite the considerable divergences in detail, the Oregon economy in the aggregate bears a striking similarity to the economy of the nation. Table 5 shows a comparison of the two economies and reveals the basic resource orientation of the Oregon economy, which, in spite of the differences, is basically similar to the United States. The principal differences are: (1) a heavier proportion in Oregon of basic nonmetal production, (2) a smaller proportion in energy, and (3) a slightly smaller proportion in final manufactured output, and (4) a slightly higher proportion of basic metals. In services the two economies are about the same. More than one third of Oregon's economy is dedicated to basic production whereas in the nation, it is less than one fourth. This difference is offset by a greater proportion, in the nation, of finished production and energy. The final demand for products in Oregon is also fundamentally similar to that of the United States, as is indicated by Table 6.

TABLE 5

COMPARISON OF THE STRUCTURE OF PRODUCTION, UNITED STATES AND OREGON, 1963

(per cent of total production)

	United States	Oregon
Basic Nonmetals	17.6	24.6
Basic Metals	6.8	7.4
Final Nonmetals	13.2	11.0
Final Metals	13.0	11.0
Energy	6.6	3.3
Services	42.8	42.7
Total	100.0	100.0

TABLE 6

COMPARISON OF OREGON AND UNITED STATES FINAL DEMAND

(per cent of gross product)

	United States	Oregon
Personal Consumption	65.3	65.9
Investment	17.1	17.8
Government	17.6	16.3
Total	100.0	100.0

This preliminary study has resulted in some interesting estimates of the structure of Oregon external trade. The estimates were derived by adding estimated domestic final demand to the interindustry requirements generated by applying estimates of Oregon output to United States input/output coefficients. The results confirm independent evidence that Oregon has an import surplus, financed by outside funds. The import surplus is about 7.5 per cent of gross domestic product. The economy of Oregon is relatively open; it exports nearly $900 million and imports more than $1,300 million, with a gross domestic product of $6,000 million.

There are four principal export industries, accounting for 85 per cent of total exports. The largest is Paper and Allied Products (accounting for one third of all exports), followed by Lumber and Wood Products and Primary Nonferrous Metal Manufacturing, in that order. Agriculture, n.e.c., principally grains, is also an important export sector. There are a number of small export industries, such as Stone, Clay, and Glass Products, and Electrical Machinery, as well as some services.

On the import side, about 85 per cent of imports are concentrated in six industries. One, of course, is Mining, but Finance, Insurance, and Real Estate (which includes all rentals) is also a large importer. The four other major importing industries are all finished manufactured goods production, including Textiles and Apparel, Nonmetal Manufacturing (the largest import industry, about one fourth of total imports), Metal Manufacturing, and Manufacturing, n.e.c. There are several other import industries of consequence, including: Transportation, Printing and Publishing, Machinery, and Livestock and Products.

VII. ILLUSTRATIVE QUANTITATIVE ANALYSIS

In this section quantitative economic analysis will be illustrated with specific examples involving economic events which could occur in the Oregon economy. The basic tool for this analysis is Table 4, the instructions for the use of which are given in equation (8). Again the reader is warned of the "iffy" nature of this analysis. If the changes postulated below were to come to pass, and if the structural relations given in Tables 3 and 4 accurately describe the structure of the Oregon economy, then the quantitative results shown are unimpeachably accurate.

Some quantitative analysis can be performed directly with the use of Table 4. For example, if final demand for Livestock and Products increases by $1 (and final demand does not decrease in some other sector), then the impact upon output can be read off Table 4 simply by reading the first (Livestock and Products) column. The output of Livestock and Products itself will increase by $1.27. Of this, $1 represents the original direct dollar of expenditure and $.27 is the secondary or indirect expansion. In addition, other Agricultural Products will expand by $.39, Mining by $.01, Maintenance and Repair Construction by $.03, and so on down the table in the first column, for a total cumulative expansion of all economic activity of $2.38.

If final demand deliveries of Lumber and Wood Products increase by $1 (and there are no other final demand changes), then the expansion will be indicated by Column 7 (Lumber and Wood Products). Livestock and Products will increase by $.02, other Agricultural Products by $.20, and so on, including a $1.45 expansion of the Lumber and Wood Products industry itself. The total expansion in this case would be $2.43. If final demand for both industries increased by $1, then the expansion of each industry would be simply the sum of each industry's expansion for each change in final demand.

A somewhat more complicated case can be analyzed. Suppose that the defense program of the United States government were accelerated and that it was decided that, among other things, $30 million in

Primary Nonferrous Metals Manufacturing output was needed. It can further be assumed that other requirements of the new program were taken out of stocks or otherwise did not have an effect upon the economy and that taxes were not increased (thereby decreasing personal consumption). The order is placed with the industry in Oregon. It is to be noted that Oregon is already an exporter and this order amounts to increasing exports by 20 per cent. Obviously, this would have a major impact on the state's economy, as is indicated in Column 1 of Table 7, which shows what the direct and indirect effects of the new order would be.

But when leaders in the industry in the state examined the order, it quickly became apparent that existing plant capacity in Oregon was not adequate to fill the order within a reasonable length of time. Hence, say the two principal firms who received the order decide to increase plant capacity, each by $5 million. Now the change in final demand consists of the original $30 million order (Column 1) and a plant expansion requiring $10 million in expenditures in various industries. The latter, however, is not all lumped in one industry, as is the former, but rather is spread out over five materials, equipment, and service industries. The impact of these final demand changes separately and together are given in Columns 2 through 6 of Table 7. The seventh column shows the total expansion in dollars, by sector, of the Oregon economy, due to the $30 million order and the subsequent plant expansion.

The $10 million plant expansion was assumed to result in orders of varying magnitude from four different industries as indicated below. It is true that many individual firms would be involved

Table 7. Nonferrous Metals Expansion

Industry	$30 million order	$10 Million Expansion to Build Plant Facility					Total
		$4 million Ind. #14 Metal Mfg.	$1 million Ind. #11 Stone,Clay, Glass	$2 million Ind. #15 Machinery	$2 million Ind. #16 Elec.Mach.	$1 million Ind. #24 Bus.Serv.	
1.Livestock and Products	$ 98,100	$ 13,640	$ 4,340	$ 5,980	$ 6,560	$ 3,850	$ 132,470
2.Agriculture, n.e.c.	150,900	22,760	7,580	9,580	10,240	7,560	208,620
3.Mining	4,944,700	269,160	109,320	55,960	63,580	11,200	5,453,920
4.Maintenance and Repair Construction	366,000	57,520	13,670	23,200	21,840	19,370	501,600
5.Food and Kindred Products	168,900	26,080	7,980	10,900	12,700	6,310	232,870
6.Textiles and Apparel	442,200	43,600	13,100	20,880	24,460	9,740	553,980
7.Lumber and Wood Products	207,600	53,160	16,480	18,300	20,320	8,480	324,340
8.Furniture	8,700	6,240	460	1,660	3,980	330	21,370
9.Paper and Allied Products	881,400	170,960	83,850	59,340	99,980	91,060	1,386,590
10.Printing and Publishing	622,500	123,720	25,450	52,240	62,580	279,600	1,166,090
11.Stone,Clay,and Glass Products	660,900	100,520	1,163,270	41,420	46,660	4,480	2,017,250
12.Nonmetal Manufacturing	3,153,300	329,480	136,750	143,500	173,180	46,300	3,982,510
13.Primary Nonferrous Metal Manufacturing	45,208,800	437,080	12,320	194,680	276,720	10,400	46,140,000
14.Metal Manufacturing	3,179,400	5,755,680	51,500	523,720	362,040	27,080	9,899,420
15.Machinery	1,425,900	270,690	18,720	2,381,980	132,160	49,490	4,278,940
16.Electrical Machinery	1,089,900	109,880	11,420	126,360	2,334,500	8,920	3,680,980
17. Manufacturing, n.e.c.	672,900	160,760	17,000	115,020	201,540	40,370	1,207,590
18.Transportation	1,648,200	256,280	90,160	77,640	81,680	27,510	2,181,470
19.Communications	336,600	45,720	10,810	28,660	24,400	96,570	542,760
20.Electricity,Water,Gas, and Sanitary Services	1,725,900	141,800	53,990	46,440	50,100	23,860	2,042,090
21.Wholesale and Retail Trade	2,350,500	305,680	61,590	148,940	141,780	44,080	3,052,570
22.Finance,Insurance, and Real Estate	1,521,600	190,440	53,140	98,840	85,980	89,560	2,039,560
23.Hotels and Repair Services	92,400	12,080	3,610	7,920	8,020	7,590	131,620
24.Business Services	903,600	127,520	33,240	66,060	71,580	1,049,130	2,251,130
25.Automotive Services	123,300	16,600	7,440	7,600	6,500	7,480	168,920
26.Medical and Educational Services	78,000	9,840	2,250	4,580	4,720	1,530	100,920
27.Services, n.e.c.	56,400	6,560	1,120	2,640	2,500	5,030	74,250
28.Government Enterprise	465,000	51,160	17,080	20,340	24,080	38,410	616,070
29.Activities, n.e.c.	598,500	150,840	24,950	61,200	75,940	35,060	946,490
Total	$73,182,100	$9,265,450	$2,052,590	$4,355,580	$4,430,320	$2,050,350	$95,336,390

but for purposes of illustration it is assumed that these firms fall into the five groups noted and that they receive all the orders for the plant and the tools contained in it. The choice of industries was guided by the table of total requirements per dollar of construction activity of various types as found in the Survey of Current Business.[13]

Much of the impact of building the plant itself would fall on Industry 14 (Metal Manufacturing) of the Oregon group. In this case it is assumed that $4 million of the total $10 million would go to this group. Stone, Clay, and Glass products benefited by an amount of $1 million; the machinery and electrical machinery groups each received additional $2 million orders; and business services firms with $1 million complete the group.

The resulting increases in interindustry requirements are listed under the appropriate headings in Table 7 along with the changes resulting from the original $30 million order. Reading across the table in any row will thus reveal the total impact on an industry from the $30 million order (Column 1) and the plant expansion (Columns 2-6) and the total of these activities in Column 7.
In the case of the machinery group (Oregon industry 15) the $30 million order resulted in $1,425,900 of additional sales; $270,690 came from the metals group in the plant expansion; $18,720 from Stone, Clay, and Glass firms; $2,381,980 from the Machinery group; $132,160 from Electrical Machinery; and $49,490 from Business Services, for a total direct and indirect impact of $4,278,940 on firms in the group.

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[13] Norman Frumkin, op. cit., p. 18, 19, Table 3.

The total impact of the expansion of plant facility can be seen as the sum of Columns 2-7 in Table 7, or $22,154,290. This includes the direct ($10 million) and indirect ($12,154,290) effects.

As interesting as is the expansion of the Oregon economy in dollars, very frequently attention, particularly by public officials, is focused on the expansionary effect upon employment in the state. How many jobs will be created by the new federal order and its induced effect on investment in Oregon? Some industries, of course, require more labor input per unit of output than others. For example, such industries as Maintenance and Repair Construction, Communications, Wholesale and Retail Trade, and Service industries are relatively labor intensive. Expansion in these sectors creates many jobs.

On the other hand, Food and Kindred Products, some textile operations, chemical and petroleum processes, metal fabrication, and many other industrial processes are highly capital intensive and require relatively little labor per unit of output. In the third column of Table 8 are the labor input/output coefficients for each sector, in terms of full-time jobs per $1,000 of output. These estimates, like the structural coefficients, are based primarily upon the United States experience, but related to the Oregon experience by the insertion of Oregon data on employment and output.

Multiplying the labor coefficient from Table 8 times the dollar expansion from Table 7 gives the number of jobs created by the output expansion and the new investment combined. Thus, by multiplying .08333 times $132,470 we find that 11 jobs would be created in the Livestock industry by the expansion of plant and output in the

TABLE 8

EMPLOYMENT EFFECTS OF NONFERROUS METALS EXPANSION

	Oregon 1963 employment	Oregon 1963 output (000,000)	Employment/ output (employed per $1,000 output)	Employment increase due to expansion
1. Livestock and Products . . .	25,000	$ 300	.08333	11
2. Agriculture, n.e.c.	40,600	335	.12119	25
3. Mining	1,400	40	.03500	191
4. Maintenance and Repair Construction	29,200	300	.09733	49
5. Food and Kindred Products .	20,700	920	.02250	5
6. Textiles and Apparel	5,200	150	.03466	19
7. Lumber and Wood Products . .	69,200	525	.13180	43
8. Furniture	2,600	60	.04333	1
9. Paper and Allied Products .	7,200	720	.01000	14
10. Printing and Publishing . .	5,300	170	.03118	36
11. Stone, Clay, and Glass Products	3,100	140	.02214	45
12. Nonmetal Manufacturing . . .	2,800	300	.00933	37
13. Primary Nonferrous Metal Manufacturing	5,300	370	.01432	661
14. Metal Manufacturing	5,200	300	.01733	172
15. Machinery	5,700	275	.02073	89
16. Electrical Machinery	6,300	285	.02211	81
17. Manufacturing, n.e.c. . . .	6,500	500	.01300	16
18. Transportation	28,300	520	.05442	119
19. Communications	9,000	150	.06000	33
20. Electricity, Water, Gas, and Sanitary Services . .	6,200	300	.02067	42
21. Wholesale and Retail Trade .	122,300	1250	.09784	299
22. Finance, Insurance, and Real Estate	24,200	320	.02951	60
23. Hotels and Repair Services .	10,200	200	.05100	7
24. Business Services	9,900	280	.03536	80
25. Automotive Services	5,000	120	.04167	7
26. Medical and Educational Services	21,600	350	.06171	6
27. Services, n.e.c.	28,400	150	.18933	14
28. Government Enterprise . . .	107,900	265	.40716	251
29. Activities, n.e.c.	98,400	115	.85565	810
Total	712,700			3,223

Note: Since the employment data in this table are reported statistics, but the output estimates have been independently derived for this study, the resulting labor coefficients should be accepted with some caution. Comparisons between industries, especially those with small differences, should not be taken as indicative of true difference.

nonferrous metals group. In the nonferrous metals group itself 661 additional jobs would result from the expansion, and for the state's economy as a whole 3,223 new jobs would result from the $30 million expansion in orders and the $10 million plant expansion combined.

The additional employment created by the expanded orders for light metals and the subsequent plant expansion can be more closely identified by application of the labor coefficients, to individual entries within columns of Table 7. This process reveals, for example, that 8 of the 11 additional jobs in the livestock industry are attributable to direct and indirect effects of the $30 million order. The remaining 3 jobs are accounted for by the direct and indirect effects of the plant expansion. In the agriculture n.e.c. group 18 of the 25 additional jobs arose from the $30 million order and 7 from the plant expansion. The reader can easily make additional comparisons by application of the appropriate data contained in Tables 7 and 8.

The vital necessity of valid coefficients is pointed up by the analysis in this section. If the coefficients in Table 3 are wrong, then the coefficients in Table 4 are wrong and all the calculations indicating economic impact are also wrong. In addition, even if the coefficients are right initially, and if a change in final demand, or any other change during the time period under analysis, alters the coefficients, then the answer does not accurately reflect the economic impact. As a small saving grace, it has been demonstrated that the inverse coefficients (equation (8) and Table 4) are not very sensitive to small changes in input/output coefficients (equation (6), Table 3). Changes in a, in other words, are spread out by the inversion process. A 50 per cent change in a particular input/output coefficient may result in all of the inverse coefficients changing by less than .1 per cent.

VIII. POTENTIAL USES

The number of specific examples of the type of quantitative analysis illustrated in the previous section is, of course, endless. The impact of any change in final demand, positive or negative, can be determined with precision within the framework of this model. In addition, as indicated earlier, it is possible to determine the amount of deliveries possible to final demand, given the output of industry. This is such a simple exercise, however, that any reader can do it with pad and pencil.

A more complex problem is that of determining the impact of technological change, that is, a change in the basic input/output coefficients. For example, suppose that capital is substituted for labor, or one kind of industrial input (petroleum) is substituted for another industrial input (coal). The method of determining the impact is conceptually simple, as illustrated earlier; one element is held constant, another is changed, and the impact on the third is calculated. When, however, there is a change in one or more technical coefficients, the entire inversion process must be done over again, a new inverse matrix (like Table 4) must be determined, and then employed as above. This is an expensive process and it was decided that, given the tentative nature of the work for Oregon so far, a different inverse, for illustrative purposes only, was not warranted.

There is no point in providing a catalog of uses to which the system may be applied. In many states of the United States and probably as many as fifty other countries the method is being used to solve practical government economic policy problems and as a guide for business men about the conduct of their business. For example, International Business Machines recently gave Harvard University $5 million to study the social and economic impact of technological change and automation. The principal tool of analysis will be the input/output method.

The United States Health Service is paying for a regional input/output study at the University of Colorado in order to predict that area's water requirements from 1970 to 2000. This problem has rather obvious relevance to Oregon. At the University of Western Ontario there is an input/output study of Canadian-United States trade. In almost every major university in the country there are projects, ranging from one-man, part-time studies up to hundreds of man-years of research, using input/output techniques. There are many studies of individual states, as well as regional and inter-regional analysis. Our neighbor (University of Washington) is embarked on a major study of that state's economic and industrial structure. The Bureau of Business and Economic Research at the University of Utah has also undertaken large-scale research of Utah's economic structure along input/output lines.

So far this article has dealthwith input/output as though it were one homogeneous method. But in fact it has many variants, and the study developed here is only one highly specialized case. It is inappropriate to go into these other kinds of studies at this point, but it must be made clear that more powerful tools of analysis can be constructed on the base built here in which a great variety of quantitative economic problems can be studied.

Consider the following as a small sample: In the input/output flow or transaction tables presented here (Tables 1 and 2), all of the transactions for investment purposes are segregated in a single column of final demand. Whenever any industry sells to increase the stock of capital, it is recorded in that column. But suppose that instead of treating the capital transactions in this way, the investment column of final demand is expanded into a whole transactions table of its own. The rows would indicate industries producing investment goods, the columns would indicate industries consuming investment goods, and the total column of this new table would be the present investment final demand column.

Thus, now there are two transactions tables, one recording current transactions and another recording capital transactions. Instead of one Table 1 there would be two such tables. It would also be possible to reformulate all of the equations above in such a way that current input/output coefficients are related to the level of output and that there are capital input/output coefficients which relate the amount of input per unit output for investment purposes to the change in output over time, since investment is undertaken in response to changes in output rather than the absolute amount of output. The final result would be that there would be two inverse matrices (tables similar to Table 4) and that a change in final demand would initiate a process of current and capital transactions through time which would trace out the precise time path of expansion of the economy to the new equilibrium position.

When one begins to think in these terms, all sorts of possibilities appear. There are different kinds of capital transactions; hence each could be separated and specific relationships for each indicated. Current transactions can also be compartmentalized in various ways. For example, some current transactions are within the state, some with other states, some with other nations. These different kinds of transactions could be segregated, structural relationships defined, and analysis, similar in concept to that above, could be performed. The analysis is more refined, more subtle, capable of answering more complicated questions in greater quantitative detail. It is necessary, however, to pay for this increasing detail, both in the amount and kind of information needed for these other models, and in the assumed structural relationships (such as the fixed input/output coefficients assumed in this study) which are required by more sophisticated models.

In addition to complicating the basic input/output system in order to achieve more knowledge of the functioning of the economy, it is possible to combine the input/output system with other kinds of economic studies. For example, it is possible to combine the input/output analysis for a city with a land use study in order to determine land requirements for the community, not only in terms of the total amount of land needed, but also the particular kinds of land which will be necessary to support the labor force and population, industries, agricultural activities, and services. Similarly water or any other general resource constraint may be studied by these methods. The input/output method can be combined with almost any other form of quantitative economic analysis. For example, business and market forecasting is reaching a highly developed state in the United States, with the use of multiple regression techniques. If one employs this device to forecast changes in final demand, the input/output method may then be used to indicate what the new final demand implies for each sector of the economy.

While the input/output method has great power and flexibility, it is always necessary to bear in mind that it is no better than the basic information which is used and the degree of correspondence between economic reality and the assumptions necessarily made in the course of analysis. The weaker the data, the weaker the analysis. The more unrealistic the assumptions, the less useful the results of analysis. At this point in the analysis of the Oregon economy, no great confidence can be placed upon the results. But in input/output studies, as in the economy generally, there is a relationship between input and output: the greater the research input, the higher and more reliable the analytical output.

IX. CONCLUSION

This first step in the analysis of the structure of the Oregon economy using input/output techniques can conclude on only one note: the first step is not very good, but without it the second step cannot be undertaken. In the view of the authors this second step awaits considerable research, which will: (1) significantly improve the output, final demand, and value added data for economic activity in the State of Oregon, (2) develop the data basis for estimating the Oregon balance of payments and balance of trade, by sector, and (3) make possible important modifications in Table 3 so that it reflects more nearly the economic structure of Oregon rather than of the United States.

Progress along these lines can be expected. But even with ample money and sufficient qualified personnel, economic research of this kind is a slow and exacting process. There is clear evidence, however, from progress in economic and econometric analysis that the degree of uncertainty about the quantitative economic impact of expected or planned circumstances or events can be significantly reduced.

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APPENDIX A

SIC INDUSTRY CONTENT OF OREGON INDUSTRY GROUPS

Industry number & Industry title	Related SIC groups
1. Livestock and Products	013,pt.014,0193,pt.02,pt.0729
2. Agriculture, n.e.c.	011,012,pt.014,0192,0199,pt.02, 074,08,091,071,0723,pt.0729,098
3. Mining	1011,106,102,103,104,105,108,109, 11,12,1311,1321,141,142,144,145, 148,149,147
4. Maintenance and Repair Construction	pt.15,pt.16,pt.17
5. Food and Kindred Products	20, 21
6. Textiles and Apparel	22, 23, 3992
7. Lumber and Wood Products	24
8. Furniture	25
9. Paper and Allied Products	26
10. Printing and Publishing	27
11. Stone, Clay, and Glass Products	32
12. Nonmetal Manufacturing	28 (exc. alumina pt. of 2819), 29, 30, 31
13. Primary Nonferrous Metal Manufacturing	2819 (alumina only), 333,334,335, 336,3392
14. Metal Manufacturing	331,332,3391,3399,34
15. Machinery	35
16. Electrical Machinery	36 (exc.368)
17. Manufacturing, n.e.c.	19,37,38,39 (exc. 3992)

18.	Transportation	40,41,42,44,45,46,47
19.	Communications	481,482,489,483
20.	Electricity, Water, Gas, and Sanitary Services	49
21.	Wholesale and Retail Trade	50 (exc. manufacturers sales offices), 52,53,54,55,56,57,58,59,pt.7399
22.	Finance, Insurance, and Real Estate	60,61,62,63,64,66,67,65 (exc. 6541 & pt.6561)
23.	Hotels and Repair Services	70,72,76 (exc. 7694 & 7699)
24.	Business Services	6541,73 (exc. 7361,7391, & pt.7399) 7694,7699,81,89 (exc. 8921)
25.	Automotive Services	75
26.	Medical and Educational Services	0722,7361,80,82,84,86,8921
27.	Services, n.e.c.	78, 79______
28.	Government Enterprise	______
29.	Activities, n.e.c.	______

Note: n.e.c.--not elsewhere classified
pt.--part
exc.--except

CHAPTER V

OCCUPATIONAL CLUSTERS
and
VOCATIONAL CURRICULA

AN OVERVIEW:
THE ROLE OF OCCUPATIONAL SKILLS
IN CURRICULUM PLANNING

In search of a system for developing a vocational education program that was more attuned with the "world of work," the Department of Vocational Education, State of Oregon, submitted a proposal[1] to the United States Commissioner of Education under provisions of Section 4(C), P. L. 88-210, *The Vocational Education Act of 1963*, to search for a method for grouping occupations that had certain common skill and knowledge requirements. Phase 1 of the Project, in part, called for the development of an instrument to identify skills and knowledge common to emerging occupations.

Much attention has been given to the need for reconstruction of the public school vocational education program. Conant,[2] in 1959, focused attention on vocational education in his report on *The American High School Today*:

> The controlling purpose of vocational education programs at the high school level is to develop skills for useful employment. These programs relate schoolwork to a specific occupational goal but involve more than training for specific job skills.

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[1] Minear, Leon P. "Statewide Study of Systematic Vocational Education Planning, Implementation, Evaluation" (Salem: State Department of Education), February 26, 1965.

[2] Conant, James B. *The American High School Today* (New York: McGraw-Hill Book Company), 1959, p. 123.

> Vocational education is not offered in lieu of general academic education, but grows out of it, supplementing and enhancing it. Vocational education is an integral part of the total education program and requires aptitude that students at the lowest academic level do not have. Slow readers, for example, are not able to benefit from regular vocational programs.

More recently, Goslin[3] conceptualizes the role of the school in present-day society:

> Educators must pay closer attention to the precise nature of the changes that are taking place and to the effect that they are likely to have on society's manpower needs. Systematic concern with these questions would make possible more effective counseling throughout the educational system and possibly the introduction of curriculum changes that would anticipate societal demands for new and different kinds of skills. Although it is of course not always possible to predict technological breakthroughs in advance, one can often make fairly accurate guesses by considering which areas are receiving the greatest attention at a given point of time.

Education today must be both liberally- and vocationally-oriented if it is to adequately satisfy the needs of youth. To do this calls for a reappraisal of our educational system. Conflict exists in what should be taught. A lag occurs in what curriculum theorists propose and what the public school practices.

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[3] Goslin, David. *The School In Contemporary Society* (New York: Scott, Foresman and Company), 1965, p. 118.

This lag is more pronounced in terms of vocational education. Traditionally, vocational education has focused on training which prepares a youngster for entry into and advancement within an occupation or a rather narrow group of occupations.

With the emergence of technology, specialized training is continuously faced with the threat of obsolescence. Because of changing occupational patterns, curricular content must become correlated with the qualitative and quantitative needs of the nation. Therefore, attempts should be made to develop content that is transferable to a number of occupations.

Vocational education must become bolder, more creative and less stereotyped by tradition. Both liberal and vocational education must make significant contributions to the learner. To accomplish this, both curricula should become amalgamated in a common objective.

Vocational education, therefore, does need reappraisal. Programs must be developed that develop the maximum potential and skill of each student. Each such student should acquire a base of general education and associated skills which are transferable and will allow him to enjoy both vertical and horizontal mobility in the structure of the vocational world.

In their quest for this flexible type of curriculum, the Department of Vocational Education enlisted the assistance of the Bureau of Educational Research, University of Oregon, to devise a method for "clustering" occupations that required similar skill and knowledge.

Selecting "Key Occupations"

The Department of Vocational Education with the technical assistance of the Oregon State Employment Service assumed the responsibility for identifying the "key occupations" to be used in the study. The criteria used in the selection of the final list of 143 occupations were: 500 or more workers currently employed in the three-digit Dictionary of Occupational Titles (DOT) classification, providing there was not a projected surplus; or need for 100 new workers during the next five-year period. Projections were based upon studies made in the Portland manpower study,[4] which comprises approximately 50 percent of the trained labor force in Oregon. These projections were verified by comparison with the Lane County Labor Skill Survey,[5] which includes approximately 10 percent of the State's labor force.

A more complete description of the procedures used will be found in the complete report of Phase 1.

Determining Curricular Content

Occupations were listed in ascending order by three-digit DOT numbers beginning with Draftsman (0-48) to Forklift and Carrier Operator (7-88). From this list, three groups were formed by assigning every third occupation to a group, e.g., Group I, occupations #1, 4, 7. . . .; Group II, occupations #2, 5, 8. . . .; Group III, occupations #3, 6, 9. . . .

A team of three labor analysts from the Oregon State Employment Service prepared job analyses for the three groups of occupations.

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[4] Oregon State Department of Employment. Manpower Resources, the Portland Metropolitan Area (Salem: Oregon State Department of Employment), 1964.

[5] Oregon State Employment Service. Lane County Labor Skill Survey (Salem: Oregon State Employment Service), 1962.

Nine occupations were selected as a sampling to establish a reliability measure for the results of the analysts. For this sampling, the first occupation from each major DOT classification (first digit) was chosen. A ninth occupation, (1-56) was chosen from the broad (1-00) classification.

The analyses of nine occupations were compared with an optimum analysis. The optimum analysis was developed by comparison of the sampling analyses with the consensus report of five labor analysts that reacted to the occupation-skill matrix, which is described later. The number of similar items reported by each of the analysts was tallied and a percentage was calculated, e.g., number of optimum factors reported by analyst A, B, and C divided by total possible factors. This procedure is similar to a method devised by Chapulsky.[6]

The results of this investigation were:

1. Five of nine job descriptions had 93 percent or more agreement.
2. Three descriptions had 70 percent or more agreement.
3. One description had 53 percent agreement.

Since most occupations are closely related to the adjoining (DOT) occupation, oversights are generally compensated for by another analyst.

A comparison of job description with the consensus of the responses to the occupation-skill matrix indicated that transposition of job description to curricular element was very good.

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[6] Chapulsky, Albert. "Comparative Factor Analyses of Clerical Jobs," Journal of Applied Psychology, Vol. 46, No. 1, 1962, p. 62-66.

A seven-member curriculum analysis team, representing the State Department of Education, the Department of Vocational Education, a vocational-technical school, and the University of Oregon were selected to transform the job descriptions to curricular elements.

A one-day briefing session was conducted to review a set of criteria for selecting curricular content[7] and to discuss other problems related to the task.

The team selected two occupations and proceeded with individual analysis. The second step was to "pool" information and to arbitrate any differences of opinion.

Following this session each of the team members independently developed a list of skills and knowledge by careful analysis of each of the job descriptions. They were asked to develop a composite list of skills and knowledge which were applicable to at least three of the occupations on the "Key Occupation" list.

The next step was to meet in conference to review their respective analyses. Modification was necessary when differences in opinion arose. A labor analyst was available at this session to clarify any misunderstandings that had arisen in interpretation of job description terminology.

The methodology for this important phase of the study was developed after review of several research publications. Selltiz[8] supports this technique by stating:

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[7] Bureau of Educational Research, "A Rational Basis for Determining Curricular Content," (See page 178).

[8] Selltiz, Claire and others. Research Methods In Social Relations (New York: Holt, Rinehart and Winston), 1963, p. 354.

Reliability of ratings is usually enhanced considerably by having several raters working as a team--making independent judgments, comparing their ratings and discussing discrepancies, and making second independent judgments that are pooled or averaged to give a final score. Much research has demonstrated the superiority of the average, or consensus, of the judgments of several people over that of one individual. Poffenbergen has written: "From the studies of judgment that are available it would seem that three independent estimates of the traits commonly judged is the minimal requirement for satisfactory work. In many cases where the variables affecting the judgment are numerous, the number should be even larger."

Clustering Occupations

The curricular analysis team developed a list of 86 "skills and knowledge" that were related to the "key occupations" in the State of Oregon. These elements were to become a part of the employer and employee data-collection devices to be used in Phase 2 of the statewide vocational education study.

Curricular elements and "key occupations" were incorporated into an occupation-skill matrix. An open-ended matrix calling for use of a dichotomous scoring system (1=present--important; omit, if not present--unimportant) was submitted to five Oregon State Employment Service labor analysts. The purpose of this step was threefold:

(1) to field test the curricular elements on a small sampling,
(2) to secure additional curricular elements,
(3) to secure data that could be transferred to data-processing cards for experimental clustering.

"Clustering" methods developed by McCormick,[9] Chapulsky,[10] and Korman[11] were reviewed. Though their purposes were quite similar, their methods were not transferable to this particular task.

Commonality between occupations has to be defined within certain limits. If one were to require 100 percent commonality of "skills and knowledge," "clustering" patterns would not emerge. Likewise, if limits are too pliable, the clusters would become too broad to become meaningful to both teachers and students. Therefore, occupations which contained 10 or more elements were used to locate 15 to 20 "clustering" bases. Occupations that had 70 percent or more similarity were combined as bases. If less, they became a "clustering" base in themselves.

After the clustering bases had been tentatively selected, the remaining occupations were programmed through the IBM 1620 to find their appropriate base. The program was written in IBM 1620 SPS III Assembly Language for a 40,000 storage computer. Two criteria were selected as being necessary for inclusion in a base:

(1) at least four elements common to the cluster,

(2) at least 70 percent commonality with the "cluster" base.

Since no empirical evidence supports the conditions of the above criteria, they can be changed to vary the size and number of clusters.

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[9] McCormick, Ernest J., Fin, Robert H., and Schaips, Charles D. "Patterns of Job Requirements" Journal of Applied Psychology, Vol. 41, No. 6, 1957, p. 358-64.

[10] Chapulsky, loc. cit.

[11] Korman, Abraham K. "Job Satisfactions of the Semi-Skilled Worker," Journal of Industrial Psychology, Vol. 2, No. 1, March, 1964.

A coefficient of commonality (C = No. of common elements/no. of elements in cluster base) was generated for each occupation to determine the degree of affinity that each occupation had for its cluster. This coefficient was used to determine the appropriate cluster for occupations that belonged to two or more clusters. The results of the initial clustering output were used to further refine the cluster bases. Instead of using a single occupation for a base, three occupations within a cluster were integrated by simply accepting or rejecting a skill on the basis of being common to at least two of the three occupations.

Cluster Output

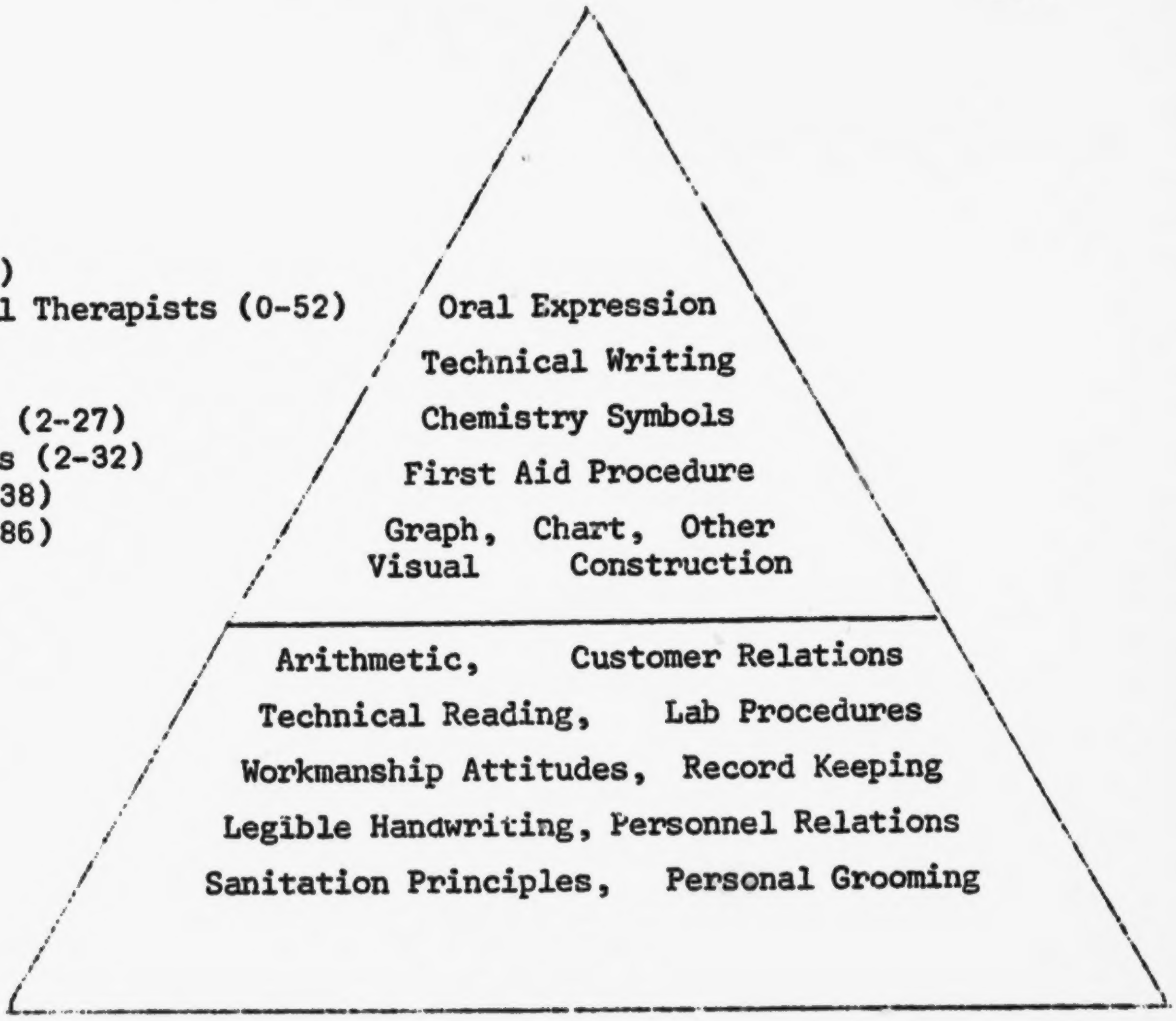
On the basis of the responses of five labor analysts, Oregon's key occupations were grouped into eight clusters. Approximately two-thirds of the total occupations appear in the eight clusters. Several reasons account for this limited clustering:

(1) On the final output, personal grooming, workmanship attitudes, safety principles, and personnelrelations were not included as skills since they were generally common to most occupations. To compensate for this, the cluster number commonality factor was reduced from four to three. The above-mentioned skills were restored to their appropriate clusters when the clusters were finally developed.

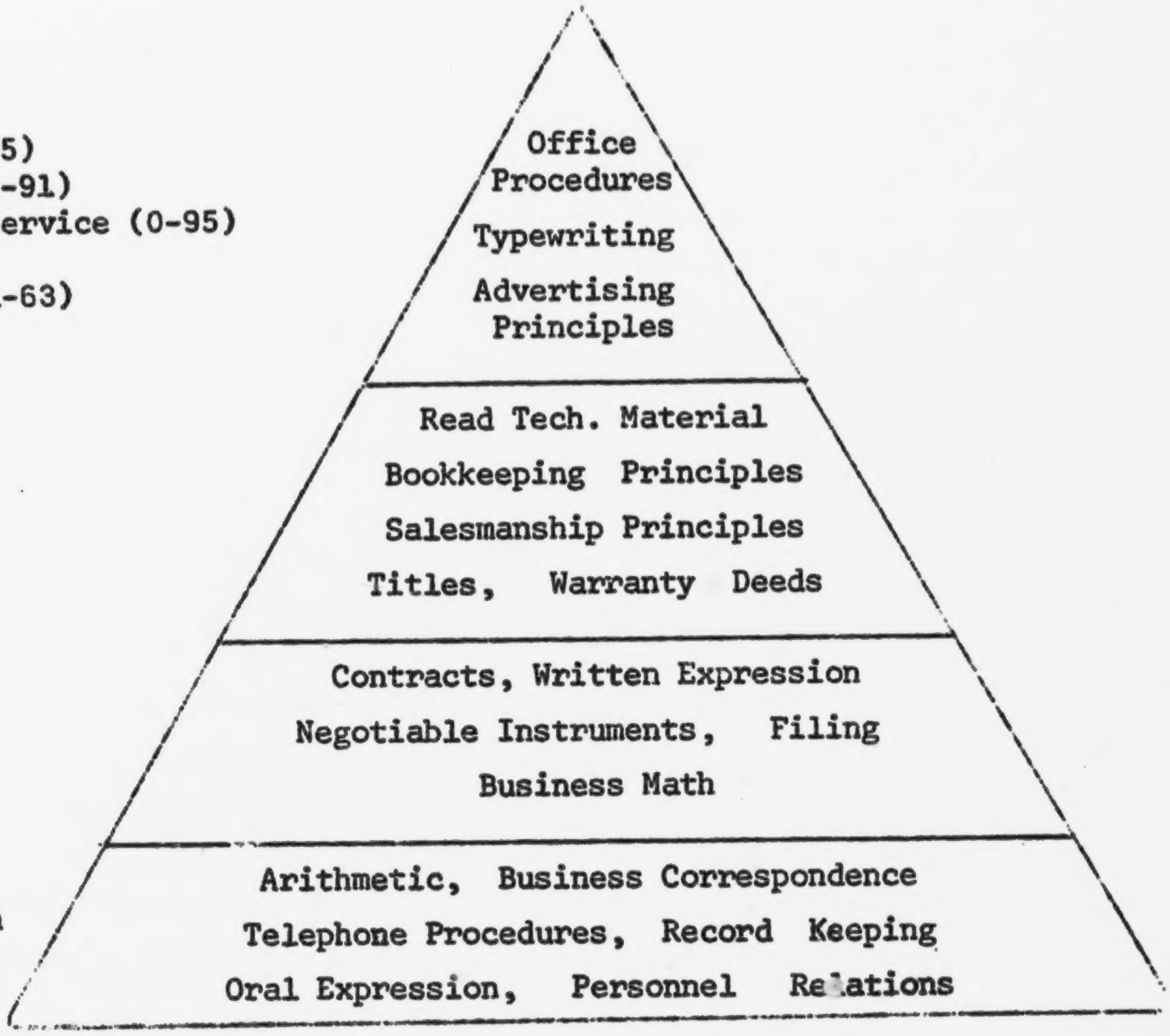
(2) Hierarchical occupations (e.g., managers, supervisors, and foremen) were not believed to be pertinent for clustering purposes.

(3) Certain occupations (e.g., farmer and draftsman) did not appear to fit into a cluster.

Lab Technician (0-50)
Miscellaneous Medical Therapists (0-52)
Embalmers (0-65)
*Bartender (2-21)
*Waiters & Waitresses (2-27)
*Beauticians & Barbers (2-32)
*Practical Nurses (2-38)
Photo Processing (5-86)

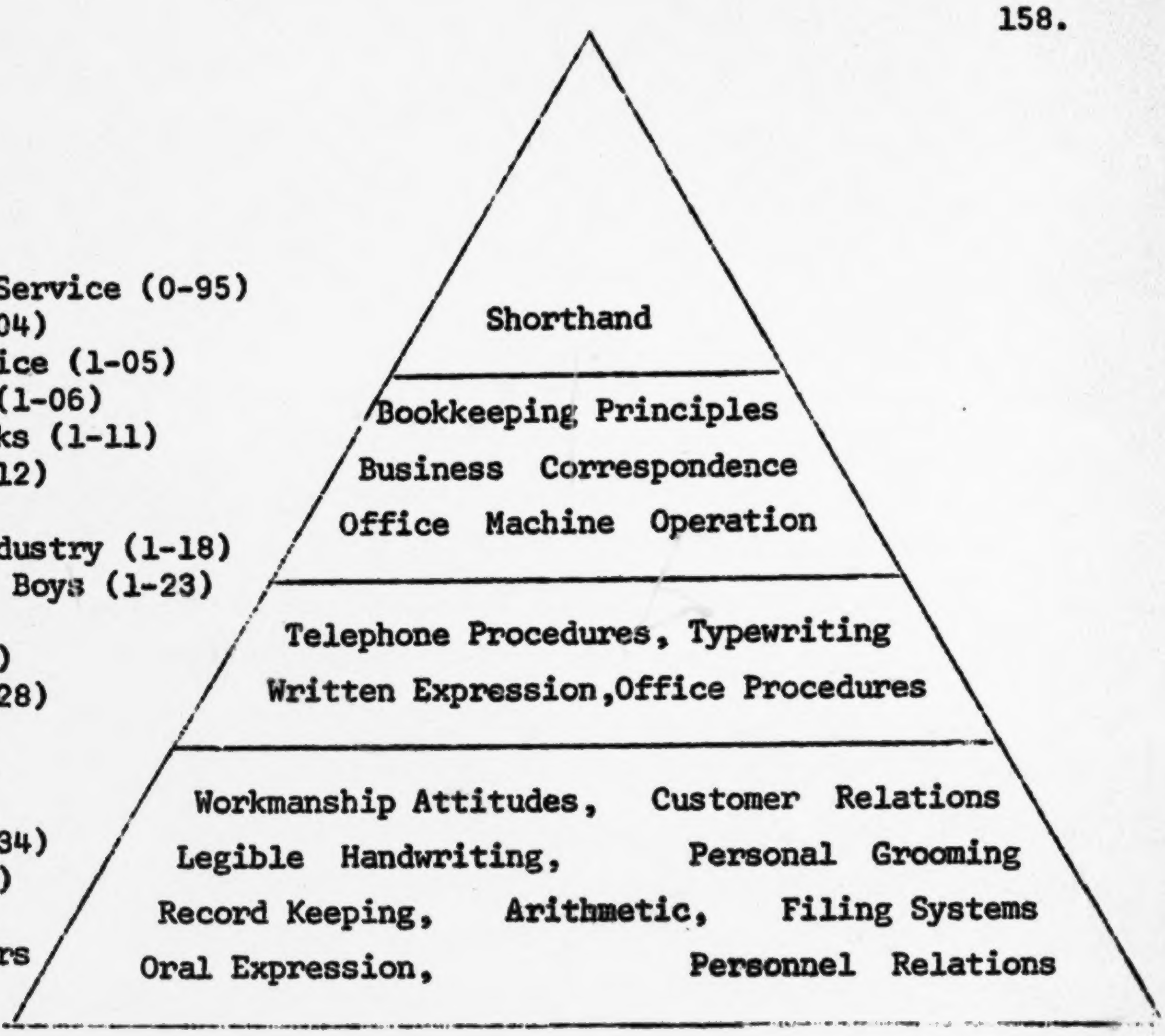

Oral Expression
Technical Writing
Chemistry Symbols
First Aid Procedure
Graph, Chart, Other Visual Construction
Arithmetic, Customer Relations
Technical Reading, Lab Procedures
Workmanship Attitudes, Record Keeping
Legible Handwriting, Personnel Relations
Sanitation Principles, Personal Grooming

Buyers (0-74)
Credit Managers (0-85)
Purchasing Agents (0-91)
*Inspectors, Public Service (0-95)
*Collectors (1-15)
Real Estate Sales (1-63)

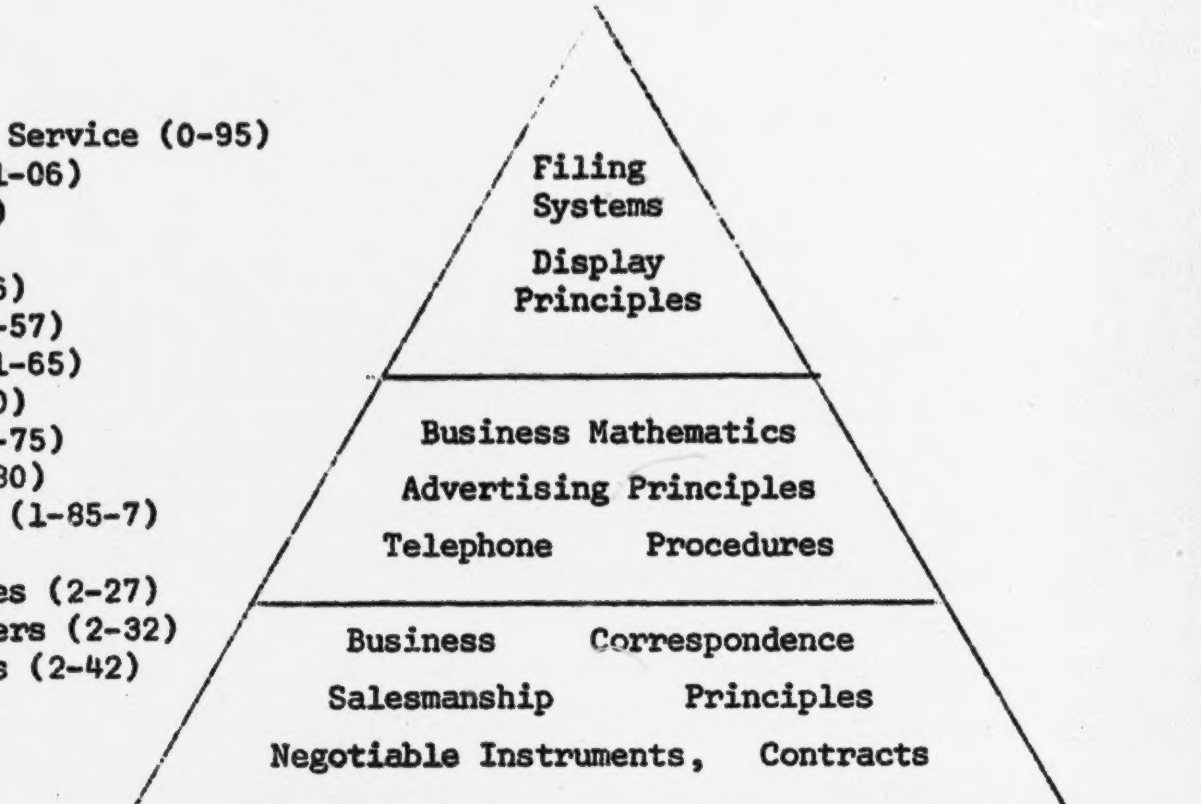

Office Procedures
Typewriting
Advertising Principles
Read Tech. Material
Bookkeeping Principles
Salesmanship Principles
Titles, Warranty Deeds
Contracts, Written Expression
Negotiable Instruments, Filing
Business Math
Arithmetic, Business Correspondence
Telephone Procedures, Record Keeping
Oral Expression, Personnel Relations

*Appears in more than one cluster.

*Inspectors, Public Service (0-95)
Clerks, General (1-04)
Clerks, General Office (1-05)
*Clerks and Tellers (1-06)
Transportation Clerks (1-11)
Clerks in Trade (1-12)
File Clerks (1-17)
Clerks, General, Industry (1-18)
Messengers & Office Boys (1-23)
Timekeepers (1-26)
Postal Clerks (1-27)
Postal Carriers (1-28)
Physician & Dentist
  Assistants (1-32)
Secretaries (1-33)
Shipping Clerks (1-34)
Stenographers (1-37)
Stock Clerks (1-38)
Switchboard Operators
  (1-42)
Miscellaneous
  Clerks (1-49)

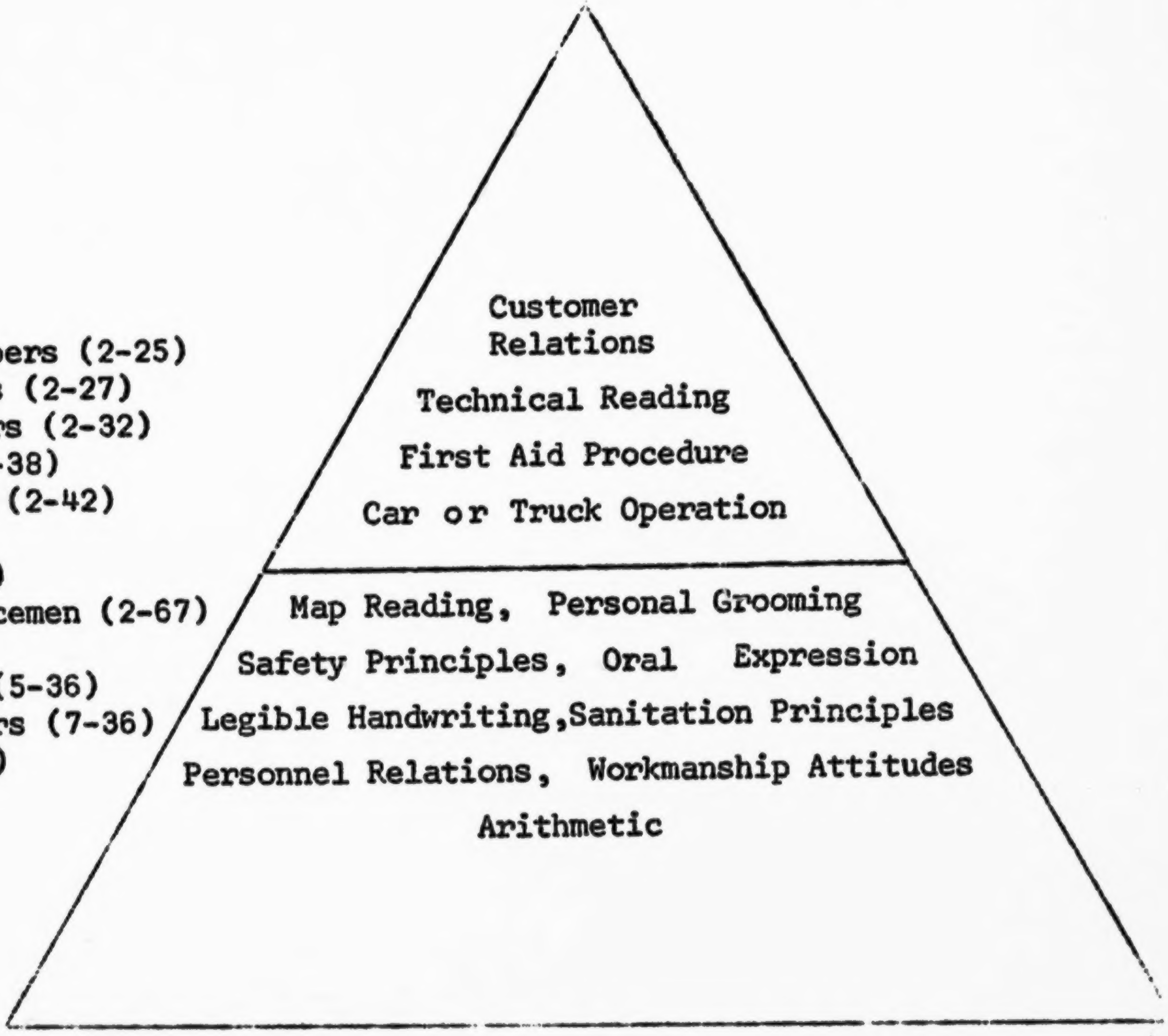

Shorthand
Bookkeeping Principles
Business Correspondence
Office Machine Operation
Telephone Procedures, Typewriting
Written Expression, Office Procedures
Workmanship Attitudes, Customer Relations
Legible Handwriting, Personal Grooming
Record Keeping, Arithmetic, Filing Systems
Oral Expression, Personnel Relations

*Inspectors, Public Service (0-95)
*Clerks & Tellers (1-06)
Hotel Clerks (1-07)
*Collectors (1-15)
Demonstrators (1-56)
Insurance Sales (1-57)
Sales Securities (1-65)
*Counter Sales (1-70)
Sales Specialty (1-75)
Consumer Sales (1-80)
Wholesale Salesmen (1-85-7)
*Bartender (2-21)
*Waiters & Waitresses (2-27)
*Beauticians & Barbers (2-32)
Hospital Attendants (2-42)
*Routemen (7-35)

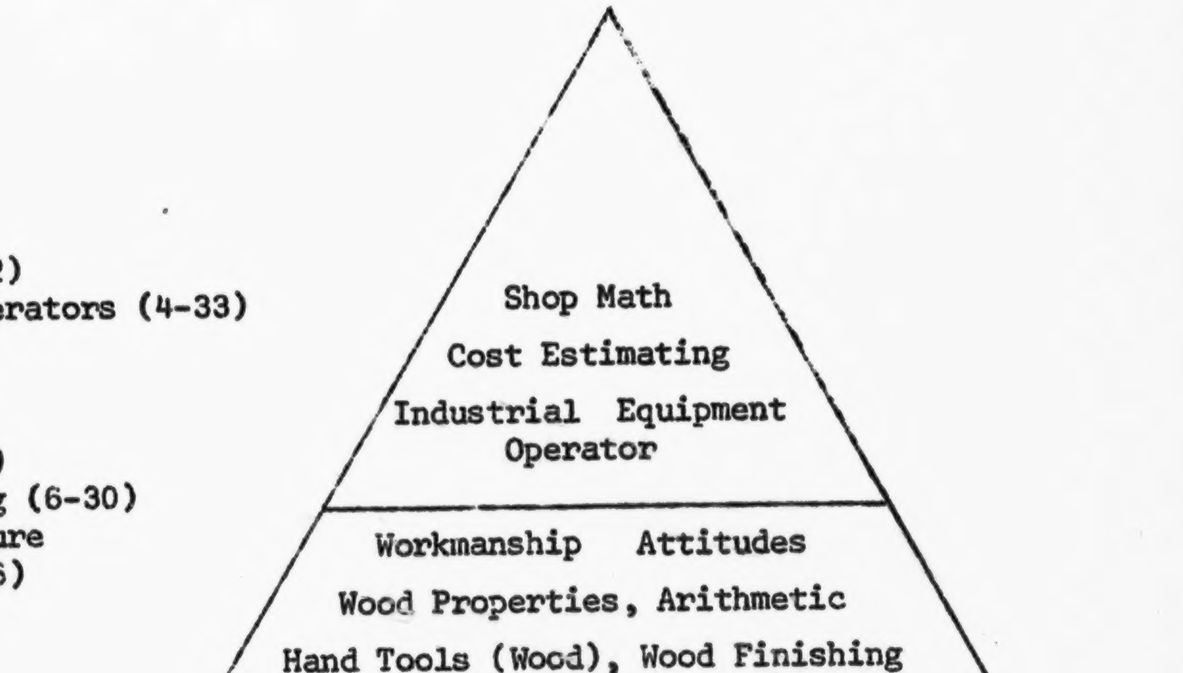

Filing Systems
Display Principles
Business Mathematics
Advertising Principles
Telephone Procedures
Business Correspondence
Salesmanship Principles
Negotiable Instruments, Contracts
Customer Relations, Oral Expression
Arithmetic, Legible Handwriting
Personnel Relations, Record Keeping

*Appears in more than one cluster.

Stock Clerk (1-38)
*Bartender (2-21)
Stewards & Housekeepers (2-25)
*Waiters & Waitresses (2-27)
*Beauticians & Barbers (2-32)
*Practical Nurses (2-38)
Hospital Attendants (2-42)
Firemen(2-63)
City Policemen(2-66)
County & State Policemen (2-67)
*Routemen (4-35)
Bus & Taxi Drivers (5-36)
Chauffeaurs & Drivers (7-36)
Public Service(7-61)

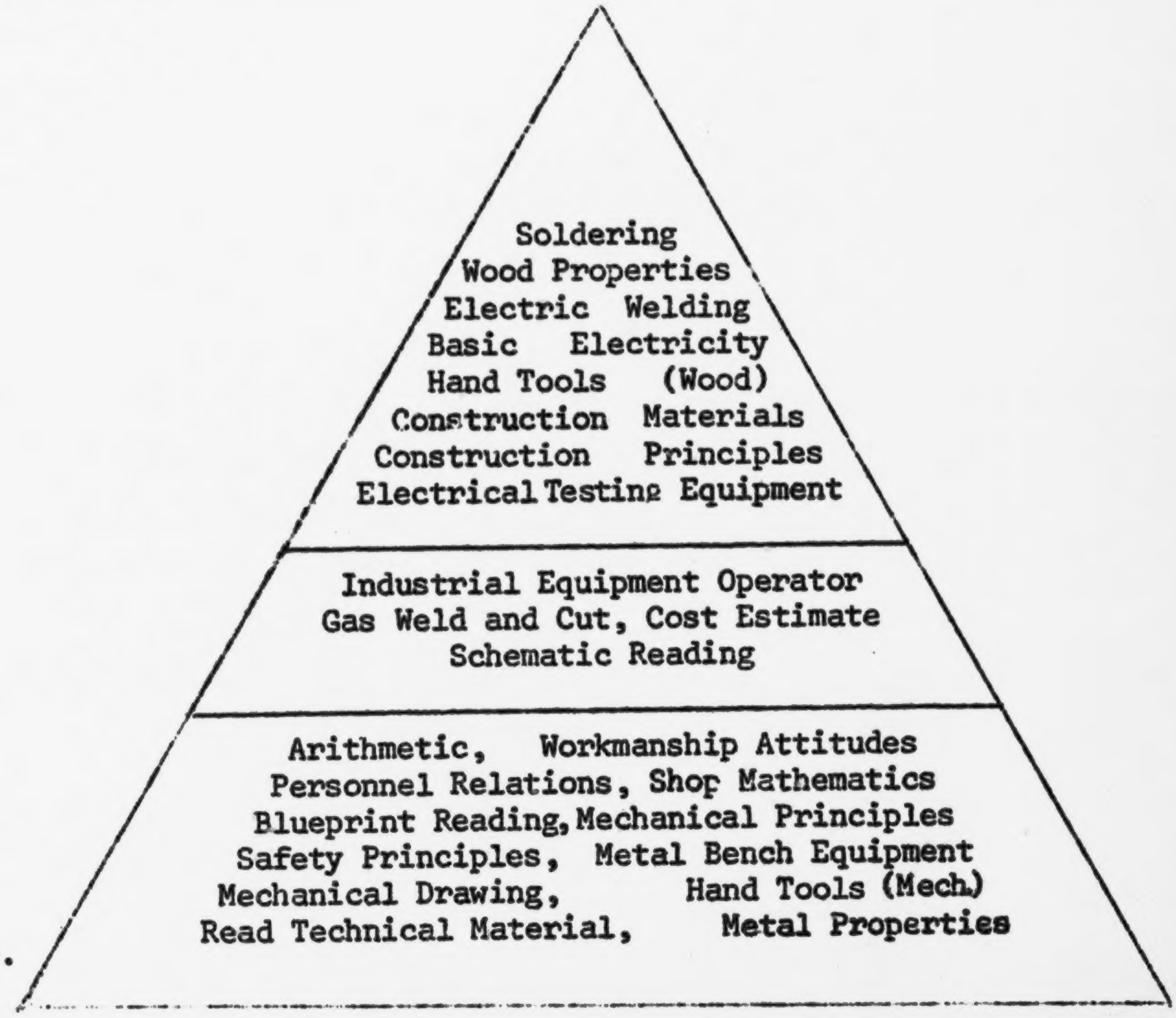

Customer Relations
Technical Reading
First Aid Procedure
Car or Truck Operation
Map Reading, Personal Grooming
Safety Principles, Oral Expression
Legible Handwriting, Sanitation Principles
Personnel Relations, Workmanship Attitudes
Arithmetic

Cabinet Makers (4-32)
Woodwork Machine Operators (4-33)
*Upholsterers (4-35)
*Carpenters (5-25)
Painters (5-27)
*Lumber Grader (6-29)
*Semi-skilled Logging (6-30)
Semi-skilled Furniture Manufacture (6-36)


Shop Math
Cost Estimating
Industrial Equipment Operator
Workmanship Attitudes
Wood Properties, Arithmetic
Hand Tools (Wood), Wood Finishing
Safety Principles, Blueprint Reading
Wood Bench Equipment, Personnel Relations

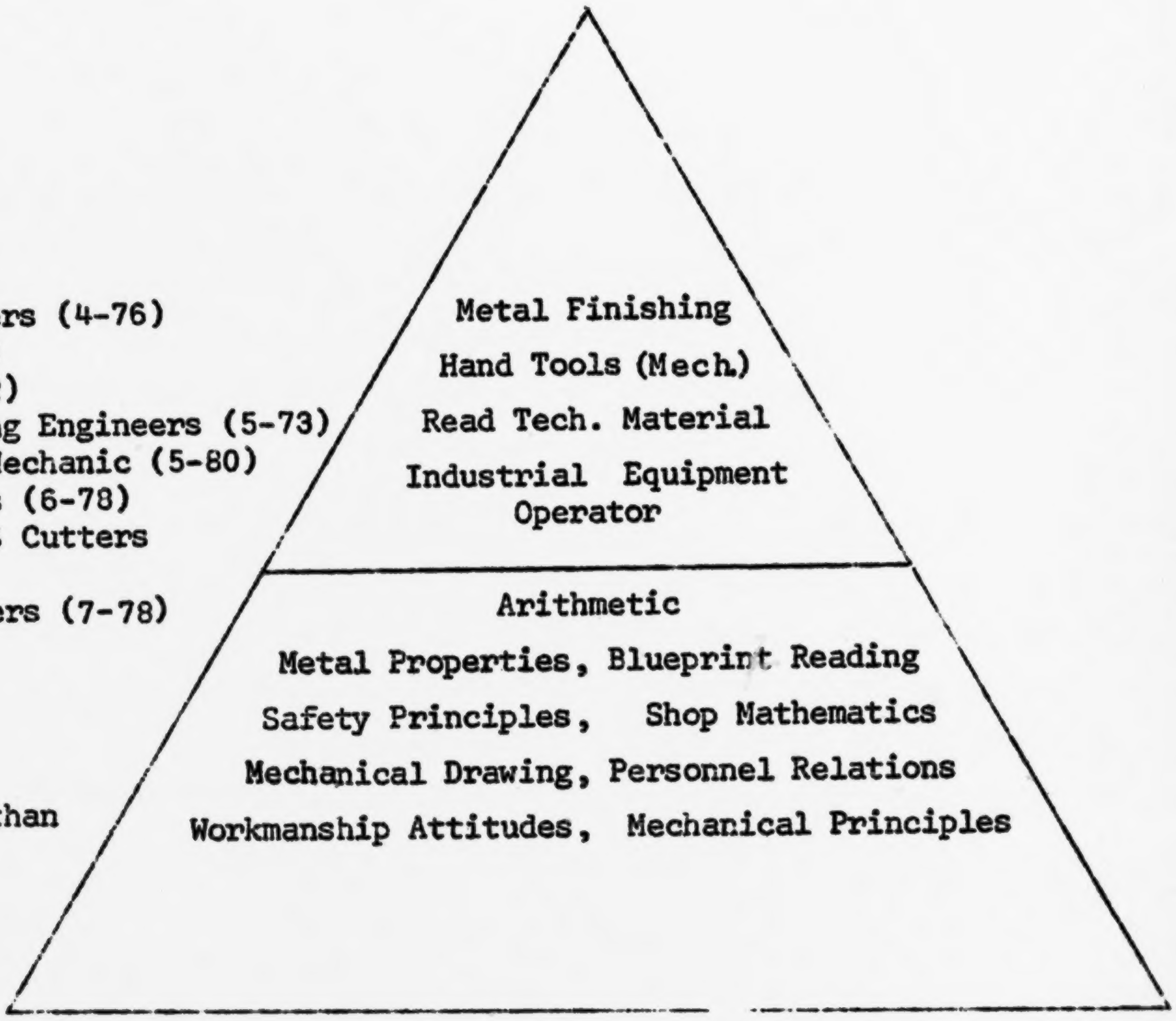
*Appears in more than one cluster.

*Upholsterers (4-35)
Cooperage (4-38)
*Sheetmetal (4-80)
*Core Makers (4-82)
Structural Steel (4-84)
Welders (4-85)
Electricians (4-97)
*Operating Engineer (5-23)
Masons (5-24)
Carpenters (5-25)
Cement Finisher (5-26)
Plumbers (5-30)
Skilled Construction (5-32)
Stat. Engineer (5-72)
Millwrights (5-78)
*Airplane Engine Mechanic (5-80)
Auto Mechanic (5-81)
Other Repairmen (5-83)
*Lumber Grader (6-29)
Semi-skilled Logging (6-30)
Machine Welders & Cutters (6-85)
Roofer (7-31)
Auto Repair Helper (7-81)
*Maint. Mech. Helpers (7-83)


Soldering
Wood Properties
Electric Welding
Basic Electricity
Hand Tools (Wood)
Construction Materials
Construction Principles
Electrical Testing Equipment
Industrial Equipment Operator
Gas Weld and Cut, Cost Estimate
Schematic Reading
Arithmetic, Workmanship Attitudes
Personnel Relations, Shop Mathematics
Blueprint Reading, Mechanical Principles
Safety Principles, Metal Bench Equipment
Mechanical Drawing, Hand Tools (Mech.)
Read Technical Material, Metal Properties

* Appears in more
than one cluster.

Machinist (4-75)
Tool and Die Makers (4-76)
*Sheetmetal (4-80)
*Core Makers (4-82)
Hoisting & Loading Engineers (5-73)
*Airplane Engine Mechanic (5-80)
Machine Operators (6-78)
Machine Welders & Cutters (6-85)
Machine Tool Makers (7-78)


Metal Finishing
Hand Tools (Mech.)
Read Tech. Material
Industrial Equipment Operator
Arithmetic
Metal Properties, Blueprint Reading
Safety Principles, Shop Mathematics
Mechanical Drawing, Personnel Relations
Workmanship Attitudes, Mechanical Principles

*Appears in more than one cluster.

Implications

The above results suggest that clustering occupations and organizing related skills and/or knowledge can be useful for vocational curriculum planning. Certain clusters are more definitive than others. Consequently, some clusters may have to be collapsed to reduce the total. Conversely, some clusters can be broken down into more specific clusters.

A complete description of the 143 "key occupations" is included in the Appendix that accompanies the full report of Phase 1. This separate manual may prove to be useful in vocational counseling or curricular planning since it not only describes the duties but includes the curricular elements as well.

Two important limitations remain regarding this sample output. First, responses from only five analysts might affect the validity of the clustering output. These results could be substantiated by seeking data from employers and employees. Secondly, the respondents may not have clearly understood the terminology used to define the particular skill or knowledge.

SELECTION OF KEY OCCUPATIONS

Oregon's labor force projection by related occupational groups was made in January 1965 by personnel of the State Department of Employment and the State Department of Education. The results of this study were used as a basis for identifying key occupations in Oregon.

Estimates of Oregon's statewide distribution of employment by occupation, and two and five-year employment expansion and replacement need by occupation, were based on these assumptions:

1. That the occupation distribution within major industrial groups, statewide, does not differ materially from that of the Portland Metropolitan Area, where figures for such distribution have been developed through intensive study.

2. That the ages of those employed in specific occupations throughout the state do not differ materially from the ages of those employed in the same occupations in the Portland Metropolitan Area.

3. That employment expansion in the statewide area outside the Portland Metropolitan Area will follow the trends of the past ten years, in general. Adjustments have been made in those areas where there is sound reason to believe substantial change is in prospect.

Due consideration was given to the fact that the major industry composition of the statewide area outside Portland is somewhat different from that of the Metropolitan Area.

The figures excluded projections for the Professional, the Unskilled, the Paid On-Farm occupations, and Self-Employed. Also excluded were many three-digit occupational groups which account for less than 100 total jobs and in which there is little projected expansion in the next five years. The total number of the work force projected for Oregon is 412,520 which is 78 percent of the wage and salary workers. The exclusion of Clark County, Washington, must be kept in mind, inasmuch as it accounts for some apparent discrepancies, particularly in the paper and pulp production occupations, between the statewide figures and the Metropolitan Area figures.

Replacement needs of the Portland Metropolitan Area were figured by use of Bureau of Labor Statistics tables. For the statewide area, these needs were expanded on the assumption that the age and sex distribution in specific occupations were not materially different, statewide, from that of the Metropolitan Area. While this would seem a reasonably safe assumption, it does prevent any guarantee of accuracy of the figures. However, based on census reports of employment by age and sex in the statewide area, it appears the figures can be guaranteed accurate within the 15 percent range for any three-digit occupational group, and within a 5 percent range for total employment.

KEY OCCUPATIONS

Card Column No.	3-Digit D.O.T. No.	Occupations	1964 Oregon Employment	Oregon 5-Year Need
7	0-48	Draftsmen	2250	1771
8	0-50	Laboratory Technicians	3220	674
9	0-52	Miscellaneous Medical Therap.	1250	188
10	0-64	Surveyors and Instrument Men	880	153
11	0-65	Embalmers ✓	360	169
12	0-67	Electronics Technicians	1100	202
13	0-68	Technicians, N.E.C.	2200	429
14	0-71	Hotel and Restaurant Managers	1740	281
15	0-72	Retail Managers	4000	655
16	0-73	Wholesale Managers	900	120
17	0-74	Buyers	1300	369
18	0-79	All Inspectors	350	135
19	0-85	Credit Managers	1150	274
20	0-87	Building Superintendent (Manager)	650	60
21	0-91	Purchasing Agents	900	217
22	0-95	Inspectors, Public Service	900	254
23	0-97	Managers and Officials, Production	16000	2980
24	0-98	Officials, Finance, Realty & Insurance	3500	655
25	0-99	Managers, N.E.C.	2035	315
26	1-01	Bookkeepers and Clerical	17650	4630
27	1-02	Machine Bookkeepers	1150	526
28	1-03	Checkers	3400	1106
29	1-04	Clerks, General	4000	1296
30	1-05	Clerks, General Office	12000	3788
31	1-06	Clerks and Tollers	1700	604
32	1-07	Hotel Clerks	500	85
33	1-11	Transportation Clerks	750	156
34	1-12	Clerks in Trade	1500	398
35	1-15	Collectors	425	153
36	1-17	File Clerks	1200	358
37	1-18	Clerks, General Industry	6500	2068
38	1-23	Messengers and Office Boys	275	131
39	1-25	Office Machine Operators	4500	670
40	1-26	Timekeepers	800	169
41	1-27	Postal Clerks	3300	791
42	1-28	Postal Carriers	2600	527
43	1-32	Physicians' and Dentists' Assistants	1300	533
44	1-33	Secretaries	7800	2962
45	1-34	Shipping and Receiving Clerks	3000	947
46	1-35	Technical Clerks, N.E.C.	600	167
47	1-37	Stenographers and Typists	14000	3786
48	1-38	Stock Clerks	2700	602
49	1-42	Switchboard Operators	3800	1166
50	1-48	Agents and Appraisers	1300	493
51	1-49	Miscellaneous Clerks, N.E.C.	700	254
52	1-56	Demonstrators	340	141
53	1-57	Insurance Sales	4400	1736
54	1-63	Real Estate Sales	1300	458

55	1-65	Sales Securities	410	290
56	1-70	Counter Sales	8000	2276
57	1-75	Sales, Specialty	11000	3242
58	1-80	Consumer Sales	3500	1027
59	1-85	Wholesale Salesmen	4100	3700
50	1-86	Wholesale Salesmen	2750	1000
51	1-87	Wholesale Salesmen	1500	423
62	2-21	Bartender	2200	380
63	2-24	Maids - Housemen	1750	417
54	2-25	Stewards - Housekeepers	600	148
65	2-26	Cooks	7000	1939
66	2-27	Waiters and Waitresses	13000	3411
67	2-29	Dishwashers - Cooks' Helpers	7000	2029
68	2-32	Beauticians and Barbers	3900	1373
69	2-38	Practical Nurses	1600	415
70	2-40	Recreation Attendants	650	145
71	2-42	Hospital Attendants	6900	2214
72	2-61	Guards and Watchmen	1500	470
73	2-63	Firemen	2000	494
74	2-66	City Policemen	2200	523
75	2-67	County and State Policemen	1250	457
76	2-82 2-84	Janitors, Charwomen, Window Cleaners, etc.	6500	1530
77	2-86	Porters	4000	388
78	3-03	Farmers	24452	
79	3-40	Groundskeepers	1200	576
80	4-01	Bakers	750	105
81	4-06	Skilled Dairy Prod. Process.	375	125
82	4-32	Cabinetmakers	1300	297
83	4-33	Woodworking Machine Operators	1000	444
84	4-35	Upholsterers	200	349
85	4-38	Cooperage	600	81
86	6-41) 6-42)	Semi-skilled Paper and Paper Goods	700	139
87	4-44) 4-49)	Skilled Printing Occupations	3500	1279
88	4-75	Machinists	5000	1870
89	4-76	Tool and Die Makers	475	154
90	4-78	Machine Tool Makers	600	246
91	4-80	Sheetmetal Workers	2100	637
92	4-82	Core Makers	410	233
93	4-84	Structural Steel Workers	700	251
94	4-85	Welders	3000	782
95	4-97	Electricians	2900	772
96	5-16	Painters except Construction	280	101
97	5-23	Operating Engineers (?)	650	161
98	5-24	Masons	500	447
99	5-25	Carpenters	7000	2160
00	5-26	Cement Finishers	600	146
01	5-27	Painters	1900	778
02	5-30	Plumbers	2500	935
03	5-32	Skilled Construction, N.E.C.	654	141
04	5-36	Bus and Taxi Drivers	2100	497
05	5-53	Linemen and Servicemen	3000	707
06	5-58	Meat Cutters	1300	602

107	5-72	Stationary Engineers	600	81
108	5-73	Hoisting and Loading Engineers	1800	169
109	5-78	Millwrights	1200	148
110	5-80	Airplane Engine Mechanics	580	214
111	5-81	Auto Mechanics	8000	2652
112	5-83	Other Repairmen	9000	2346
113	5-86	Photo Processing	300	198
114	5-91) 5-92)	Foremen, Manufacturing	4000	516
115	5-94	Foremen, Construction	600	186
116	5-95	Foremen, Transp., Comm., and Utilities	900	167
117	5-97	Foremen, Services and Amusements	1000	119
118	5-99	Foremen, N.E.C.	750	110
119	6-06	Semi-skilled Dairy Prod.	600	150
120	6-08	Semi-skilled Grain Products	450	237
121.	6-21) 6-27)	Semi-skilled Fabricated Text.	2400	682
122	6-29	Lumber Grader	600	100
123	6-30	Semi-skilled Logging	8000	692
124	6-33	Semi-skilled Woodworking Operator	1900	290
125	6-36	Semi-skilled Furniture Mfg .	460	519
126	6-39	Semi-skilled Misc. Wood Products	10500	1042
127	6-49	Semi-skilled Printing	380	171
128	6-50) 6-54)	Semi-skilled Chemicals	380	152
129	6-78	Machine Operators	2100	776
130	6-85	Machine Welders and Cutters	600	210
131	6-93) 6-95)	Semi-skilled Metal Fabrication other than Electrical	375	126
132	6-97) 7-00)	Fabrication of Electrical Equipment	2200	324
133	7-02	Automotive Assembler	750	443
134	7-10) 7-13)	Assembler, Misc. Mfg.	315	261
135	7-23	Construction Machinery Operators, Bulldozers, Graders, etc.	400	94
136	7-27	Painters, Rough	325	152
137	7-31	Roofers	400	334
138	7-32	Semi-skilled Construction, N.E.C.	700	169
139	7-35	Routemen	3200	569
140	7-36	Chauffeurs and Drivers	16000	3844
141	7-36	Tractor Operators	1200	190
142	7-57	Cleaners and Pressers	3000	552
143	7-60	Auto Service Station Attendants	6000	1404
144	7-61	Public Service (Hwy., Parks, etc.)	800	117
145	7-68	Packers, Fitters, Labelers, and Related, N.E.C.	900	175
146	7-81	Auto Repair Helpers	1000	284
147	7-83	Helpers to Maintenance Mechanics	1000	111
148	7-85	Transp. Equip. Washers, Greasers, etc.	400	652
149	7-88	Forklift and Carrier Operator	2100	306

JOB ANALYSIS PROCEDURES

In cooperation with labor analysts from the Oregon State Employment Service, the following plan was developed to analyze all jobs to be included in the horizontal component of the occupation-skill matrix:

1. Divide the list of 143 "key occupations" into three groups, i.e., Group I (Mr. Lacey), Occupation #1, 4, 7, . . .etc.; Group II (Mr. Brown), #2, 5, 8, . . . etc.; Group III (Mr. Botkin), #3, 6, 9, . . . etc.
2. From "key occupations," select the first occupation from each major D.O.T. classification (first digit). Include a second occupation (first of sales section) from D.O.T. Group 1-00. The nine three-digit occupational groups thus selected will constitute the sampling to be used for establishing reliability.
3. Each analyst involved in this study shall be responsible for his assigned group as well as for the reliability sampling. Inasmuch as two analysts will each work on half of Group III, both of these analysts shall be responsible for the reliability sampling group.
4. After the three groups have been analyzed, Mr. Brown and Mr. Lacey will review the job analyses.

For source material, analysts, besides their own background, may draw from such resources as the Dictionary of Occupational Titles, the Oregon Supplement to the Dictionary of Occupational Titles, the Occupational Outlook Handbook, OSES publications and other pertinent materials, as well as from professional colleagues.

The analysts will prepare job descriptions for each of the 143 "key occupations." They will also specify the knowledges and skills that are necessary in order to function effectively in that particular job. It should be noted that a three-digit D.O.T. classification is broad and encompasses a number of occupations. The labor analyst is to select for purposes of analysis the five- or six-digit occupation that best represents the broad classification. This method is satisfactory since information to be collected later from labor analysts, employees and employers will be categorized on the three-digit basis.

In preparing the job description, physical demands and environmental factors are to be disregarded. Labor analysts will agree to a common reporting language that describes each job in the same degree of detail or specificity.

Several limitations should be mentioned in the procedure as outlined. First, it would be more desirable if each analyst would prepare a description for each of the "key occupations." Availability of personnel prevents this more time-consuming method. Second, the job information to be utilized from sources as previously cited will be derived from detailed job descriptions rather than actual job observation and interview. Though these analyses are to be prepared by specialized personnel from the DES, it is possible that somewhat different results would be obtained if direct observation of the jobs had been feasible.

LISTS OF OCCUPATIONS

Card Column No.	3-Digit D.O.T. No.	Occupations	Group I	Group II	Group III
			Mr. Lacey	Mr. Brown	Mr. Botkin
7	0-48	Draftsmen	x	x	x
8	0-50	Laboratory Technicians		x	
9	0-52	Miscellaneous Medical Therap.			x
10	0-64	Surveyors and Instrument Men	x		
11	0-65	Embalmers		x	
12	0-67	Electronics Technicians			x
13	0-68	Technicians, N.E.C.	x		
14	0-71	Hotel and Restaurant Managers		x	
15	0-72	Retail Managers			x
16	0-73	Wholesale Managers	x		
17	0-74	Buyers		x	
18	0-79	All Inspectors			x
19	0-85	Credit Managers	x		
20	0-87	Building Superintendent (Manager)		x	
21	0-91	Purchasing Agents			x
22	0-95	Inspectors, Public Service	x		
23	0-97	Managers and Officials, Production		x	
24	0-98	Officials, Finance, Realty & Insurance			x
25	0-99	Managers, N.E.C.	x		
26	1-01	Bookkeepers and Clerical	x	x	x
27	1-02	Machine Bookkeepers			x
28	1-03	Checkers	x		
29	1-04	Clerks, General		x	

LISTS OF OCCUPATIONS
(cont)

Card Column No.	3-Digit D.O.T. No.	Occupations	Group I Mr. Lacey	Group II Mr. Brown	Group III Mr. Botkin
30	1-05	Clerks, General Office			x
31	1-06	Clerks and Tellers	x		
32	1-07	Hotel Clerks		x	
33	1-11	Transportation Clerks			x
34	1-12	Clerks in Trade	x		
35	1-15	Collectors		x	
36	1-17	File Clerks			x
37	1-18	Clerks, General Industry	x		
38	1-23	Messengers and Office Boys		x	
39	1-25	Office Machine Operators			x
40	1-26	Timekeepers	x		
41	1-27	Postal Clerks		x	
42	1-28	Postal Carriers			x
43	1-32	Physicians' & Dentists' Assist.	x		
44	1-33	Secretaries		x	
45	1-34	Shipping and Receiving Clerks			x
46	1-35	Technical Clerks, N.E.C.	x		
47	1-37	Stenographers and Typists		x	
48	1-38	Stock Clerks			x
49	1-42	Switchboard Operators	x		
50	1-48	Agents and Appraisers		x	
51	1-49	Miscellaneous Clerks, N.E.C.			x
52	1-56	Demonstrators	x	x	x
53	1-57	Insurance Sales		x	
54	1-63	Real Estate Sales			x

LISTS OF OCCUPATIONS
(cont)

Card Column No.	3-Digit D.O.T. No.	Occupations	Group I Mr. Lacey	Group II Mr. Brown	Group III Mr. Botkin
55	1-65	Sales Securities	x		
56	1-70	Counter Sales		x	
57	1-75	Sales, Specialty			x
58	1-80	Consumer Sales	x		
59	1-85	Wholesale Salesmen		x	
60	1-86	Wholesale Salesmen			x
61	1-87	Wholesale Salesmen	x		
62	2-21	Bartender	x	x	x
63	2-24	Maids - Housemen			x
64	2-25	Stewards - Housekeepers	x		
65	2-26	Cooks		x	
66	2-27	Waiters and Waitresses			x
67	2-29	Dishwashers - Cooks' Helpers	x		
68	2-32	Beauticians and Barbers		x	
69	2-38	Practical Nurses			x
70	2-40	Recreation Attendants	x		
71	2-42	Hospital Attendants		x	
72	2-61	Guards and Watchmen			x
73	2-63	Firemen	x		
74	2-66	City Policemen		x	
75	2-67	County and State Policemen			x
76	2-82) & 2-84)	Janitors, Charwomen, Window Cleaners, etc.	x		
77	2-86	Porters		x	
78	3-03	Farmers	x	x	x

LISTS OF OCCUPATIONS
(cont)

Card Column No.	3-Digit D.O.T. No.	Occupations	Group I	Group II	Group III
			Mr. Lacey	Mr. Brown	Mr. Botkin
79	3-40	Groundskeepers	x		
80	4-01	Bakers	x	x	x
81	4-06	Skilled Dairy Prod. Process.			x
82	4-32	Cabinet Makers	x		
83	4-33	Woodworking Machine Operators		x	
84	4-35	Upholsterers			x
85	4-38	Cooperage	x		
86	6-41) & 6-42)	Semi-skilled Paper and Paper Goods		x	
87	4-44) & 4-49)	Skilled Printing Occupations			x
88	4-75	Machinists	x		
89	4-76	Tool and Die Makers		x	
90	4-78	Machine Tool Makers			x
91	4-80	Sheetmetal Workers	x		
92	4-82	Core Makers		x	
93	4-84	Structural Steel Workers			x
94	4-85	Welders	x		
95	4-97	Electricians		x	
96	5-16	Painters except Construction	x	x	x
97	5-23	Operating Engineers	x		
98	5-24	Masons		x	
99	5-25	Carpenters			x
100	5-26	Cement Finishers	x		
101	5-27	Painters		x	

LISTS OF OCCUPATIONS (cont)

Card Column No.	3-Digit D.O.T. No.	Occupations	Group I Mr. Lacey	Group II Mr. Brown	Group III Mr. Botkin
102	5-30	Plumbers			x
103	5-32	Skilled Construction, N.E.C.	x		
104	5-36	Bus and Taxi Drivers		x	
105	5-53	Linemen and Servicemen			x
106	5-58	Meat Cutters	x		
107	5-72	Stationary Engineers		x	
108	5-73	Hoisting and Loading Engineers			x
109	5-78	Millwrights	x		
110	5-80	Airplane Engine Mechanics		x	
111	5-81	Auto Mechanics			x
112	5-83	Other Repairmen	x		
113	5-86	Photo Processing		x	
114	5-91) & 5-92)	Foremen, Manufacturing			x
115	5-94	Foremen, Construction	x		
116	5-95	Foremen, Transp., Comm., and Utilities		x	
117	5-97	Foremen, Services & Amusements			x
118	5-99	Foremen, N.E.C.	x		
119	6-06	Semi-skilled Dairy Prod.	x	x	x
120	6-08	Semi-skilled Grain Products			x
121	6-21) & 6-27	Semi-skilled Fabricated Text.	x		
122	6-29	Lumber Grader		x	
123	6-30	Semi-skilled Logging			x
124	6-33	Semi-skilled Woodworking Operator	x		

LISTS OF OCCUPATIONS
(cont)

Card Column No.	3-Digit D.O.T. No.	Occupations	Group I Mr. Lacey	Group II Mr. Brown	Group III Mr. Botkin
125	6-36	Semi-skilled Furniture Mfg.		x	
126	6-39	Semi-skilled Misc. Wood Prod.			x
127	6-49	Semi-skilled Printing	x		
128	6-50) & 6-54)	Semi-skilled Chemicals		x	
129	6-78	Machine Operators			x
130	6-85	Machine Welders and Cutters	x		
131	6-93) & 6-95)	Semi-skilled Metal Fabrication other than Electrical		x	
132	6-97) & 7-00)	Fabrication of Electrical Equipment			x
133	7-02	Automotive Assembler	x	x	x
134	7-10) & 7-13)	Assembler, Misc. Mfg.		x	
135	7-23	Construction Machinery Operators, Bulldozers, Graders, etc.			x
136	7-27	Painters, Rough	x		
137	7-31	Roofers		x	
138	7-32	Semi-skilled Construction, N.E.C.			x
139	7-35	Routemen	x		
140	7-36	Chauffeurs and Drivers		x	
141	7-36	Tractor Operators			x
142	7-57	Cleaners and Pressers	x		
143	7-60	Auto Service Station Attendants		x	
144	7-61	Public Service (Hwy., Parks, etc.)			x
145	7-68	Packers, Fitters, Labelers, and Related, N.E.C.	x		

LISTS OF OCCUPATIONS
(cont)

Card Column No.	3-Digit D.O.T. No.	Occupations	Group I Mr. Lacey	Group II Mr. Brown	Group III Mr. Botkin
146	7-81	Auto Repair Helpers		x	
147	7-83	Helpers to Maintenance Mechanics			x
148	7-85	Transp. Equip. Washers, Greasers, etc.	x		
149	7-88	Forklift and Carrier Operator		x	

LABOR ANALYST TEAM

Vita Sheet

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University of Oregon
Central Oregon College

Related Work Experience : Manager, Publications Company; Manager, Meatpacking Company; Manager, Wholesale Oil Company; Supervisor, State Youth Services, Oregon State Employment Service; Manager, Oregon City Office, Oregon State Employment Service; Supervisor, Bend Office, Oregon State Employment Service; Supervisor, Employer Relations, Oregon State Employment Service

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OVERVIEW FOR DETERMINING CURRICULAR CONTENT

Following the receipt of the report from the Employment Security Department, curriculum analysts will have a briefing session to review the procedures involved in this phase of the preparation of the vertical components of the occupation-skill matrix.

At this briefing session, the members of the curriculum analysis team which consists of staff members of the State Department of Education, a student personnel services specialist from Salem Public Schools, and research assistants from the Bureau of Educational Research, University of Oregon, and a Professor of Education, University of Oregon will review the background material and criteria as developed in "A Rational Basis for Determining and Organizing Curricular Content."

Details on the use of the criteria will be fully explored at the briefing session. Several specimen job analyses will be reviewed and discussed in terms of the criteria. In this manner, the team will develop some consistency before beginning their independent work.

Following this session, each curricular analyst will receive a complete set of job duties and essential skills and knowledges. Using the selected criteria, he will formulate a complete set of elements to form the vertical component of the occupation-skill matrix. In the process of performing this task, the analyst may find it necessary to edit or combine some of the skills and knowledge as submitted by the labor analyst. When combining knowledges or skills, he should maintain a record to enable him to communicate more effectively at the next stage of development.

This next stage of development is for the purpose of pooling the responses of each of the curricular analysts. Where differences of opinions arise the team as a whole will make the final decision. A labor analyst will be available for this conference to clarify any job description terminology. The team is responsible for describing the elements at the same level of specificity.

Following this step, a composite list of elements will be prepared bearing in mind to combine those elements that are similar and to edit the description of skill or knowledge so that it can be placed on a matrix. Since this matrix is to appear on questionnaires to be submitted to labor analysts, employers, employees, care must be exercised to develop terminology that is meaningful to all respondents.

Following the preparation of a draft of the elements of the vertical component, the tentative occupation-skill matrix will be submitted to the labor analysts in order that they may respond to each cell in the matrix. A dichotomous scoring system will be used: 1 = present--important, 0 = not present--unimportant

After these responses have been tabulated, criterion #2, page 12 of "A Rational Basis for Determining Curricular Content" will be applied. The element will be dropped from the matrix if it fails to satisfy at least one of the conditions: (1) represented in three or more occupations; (2) represented by occupations totaling 7,000 or more workers.

Criterion #3, page 12 can only be applied after responses from labor analysts, employers and employees are tabulated. All skill and knowledge which can be placed into a cluster can be structured in a manner meaningful to the learner.

CURRICULAR ANALYST TEAM

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Publications: *Foundations of Curriculum Planning and Development*; *Readings in Education*; *Economics of Education*

A RATIONAL BASIS FOR DETERMINING AND ORGANIZING CURRICULAR CONTENT

The birth of new nations, the impact of new inventions and discoveries, the threat of new weapons, the stirring of new ideas, and even the ascent into a new dimension of the universe--everywhere the accent falls on the new. Education is challenged as never before to move forward in philosophy and program to meet the challenge of change and the demand for better quality.

--"Education in a Changing Society," NEA Project on Instruction

Teaching has been described as the act of creating or designing learning situations. It could be expressed as a form of stage-setting whereby the learner acquires concepts through the process of inquiry and discovery.

The curriculum is a summation of the learner's engagements with various aspects of a broad environment which are planned within the school. Taba[1] describes curriculum as a plan for learning. She further distinguishes that "adequate curriculum planning involves selecting and organizing both the content and the learning experiences."

What constitutes adequate curriculum becomes the crucial question. Watson[2] states: "Choice of curriculum content in the future must depend upon the service of knowledge, attitudes and skills to contemporary and emerging society, and on the personal satisfactions they bring to the learners."

Three distinct, but interrelated levels determine the shape of the school curriculum. Each day as the teacher enters the classroom instructional decisions are made which determine the experiences students will encounter during that day. Outside the classroom, professional colleagues make building and school district decisions that create the format of the curriculum. Still farther removed, elected representatives are making decisions that represent the wishes of society. These latter decisions are usually influenced by visible or invisible forces.

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[1] Taba, Hilda. CURRICULUM DEVELOPMENT THEORY AND PRACTICE. (New York: Harcourt, Brace and World, Inc.), 1962, p. 266.

[2] Oregon State Department of Education. THE OREGON PROGRAM. (Salem: State Department of Education), 1965, p. 3.

Visible Forces

As well it should be, tradition is a powerful determinant of what schools shall teach. Time-tested skills and knowledges should receive high priority from curriculum-planners. However, in an affluent and changing society, the patterns of the past may not be adequate to provide the essential learning experiences to cope with the future. Therefore, the shapers of curriculum must possess rational insights of the future as well as the ability to discard the obsolete even though it is comfortable. The professional educator, as well as society, must be willing to discard his biases and examine needs as they exist today.

Public opinion exerts a dynamic influence on curricular decisions. The American public is divided in its opinion so that even the most diverse views enlist considerable support. Spokesmen, such as Rickover, Conant, Rafferty, and Taba have played a part in creating the public's views of what the schools should teach. Out of differing opinions, American education comes up with a strengthened ultimate decision.

Campaign promises have provided impetus to certain elements of the curriculum. A good example has been the "War on Poverty." As a result, school leaders have shown an increasing concern about the plight of the disadvantaged.

Dramatic points of view expressed in mass media have stimulated the public to become concerned about their schools. Unfortunately, the format of mass media coverage often lacks reasoned analysis and becomes a counter-force that professionals must combat. Mass media arousement may lead to results that can be ineffective or even harmful.

Authors and publishers carry a strong hand in perpetuating the existing curricula. Rather than encourage change, most materials are developed after a review of present practices. A trend, however, is toward engaging competent scholars who have been involved in national studies to strengthen the appeal of curricular innovations. Special studies financed largely from federal grants and/or private foundations have attempted to close the gap between research findings in the academic fields and the related subjects as they are taught in the school. The focal point varies from a narrow viewpoint encompassing a select group of students to a broad perspective involving all students.

Programmed materials continue to grow as a potential source of curricular influence. However, Lumsdaine[3] and Hilgard[4], two of the most prominent learning theorists, foresee use of these types of materials as segments of a subject rather than encompassing an entire field. The problem of integrating "programs" with other learning experiences could become crucial and will no doubt require careful staff planning.

There are many other elements that affect or influence curricular decisions. Briefly, this list might include colleges, accrediting associations, foundations, test publishers, professional associations, and governmental agencies, just to name a few.

Invisible Forces

In recent years, our value system has become of increasing importance in shaping the school curriculum. "Education for all" has become a high priority in attempting to attain a stronger core within our democracy. Special programs have been provided for the disadvantaged in an attempt to destroy the "pockets of poverty." Studies by such authorities as Pearl[5] and Sexton[6] suggest that disadvantaged students may have far more potential than they exhibit.

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[3] Lumsdaine, A. A. "Educational Technology, Programmed Learning and Instructional Science," THEORIES OF LEARNING AND INSTRUCTION. (Chicago: National Society for Study of Education), 1964, p. 389.

[4] Hilgard, Ernest and Sears, Pauline, "The Teacher's Role in the Motivation of the Learner," THEORIES OF LEARNING AND INSTRUCTION. (Chicago: National Society for Study of Education), 1964, p. 191.

The tendency is to underestimate the capacity of the learner. A recent publication from the Committee of the NEA Project on Instruction[7] advises:

> In setting up special programs for disadvantaged students, care must be taken that intellectual content is not passed over lightly enroute to vocational education. All students should be taught, to the limit of their capacity, how to learn and how to think critically and rationally. They should achieve reasonable mastery of the basic tool subjects. For instance, disadvantaged students should be taught science as well as science appreciation. While the science concepts taught might be simplified, students should learn the fundamentals of science even if this takes more time.

While the disadvantaged may become employable after a bout with traditional education, he could become unemployable at a later date because of obsolescence. Technology has influenced the character of many jobs and will continue to do so on perhaps a pyramiding basis. The new Dictionary of Occupational Titles is reported to have only 6,000 new job entries in comparison to its counterpart published in 1949. However, even though the job title remains, the skill level and requirements have changed considerably. The continuing threat of obsolescence, therefore, suggests that the school curricula must remain flexible.

Mobility has had and will continue to have an influence on the school curricula. No longer can the local school system anticipate that its local graduates will become citizens in the community. The United States Department of Labor[8] reports:

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[5] Pearl, Arthur. NEW CAREERS FOR THE POOR. (New York: Free Press), 265 pp.

[6] Sexton, Patricia. EDUCATION AND INCOME. (New York: Viking Press), 1961, 298 pp.

[7] NEA Project on Instruction. EDUCATION IN A CHANGING SOCIETY. (Washington: National Education Association), 1963, p. 87.

> For example in a recent year, more than 8 million different workers changed jobs. These 8 million workers made 11½ million job changes........About 7 percent of all male workers are now living in a county different from the one they were in the year before. More than half of them are also living in a different state.

These statistics have implications for every community and especially its school system. State and national data and trends must have bearing on curriculum planning. Mobility, concentrations of industries, and changing requirements for skilled and technical jobs all have relevance when preparing plans for vocational and general education.

Still another factor that has contributed to a revolution in education has been appropriately termed the "knowledge explosion." The NEA Project on Instruction[9] has identified the dilemma facing schools.

> The explosion of knowledge or the "information revolution" is probably the most important single factor forcing change upon education. So much has been learned in so many areas that it is no longer possible for students to learn even summaries of existing knowledge. The sheer bulk of knowledge defeats any effort to teach it as a body of facts. We can expect radical reorganization of a given body of knowledge not once in the coming century but several times, at intervals of 10 to 20 years. The serious critics of education, both in schools and in colleges, are not as much concerned with the amount of knowledge students possess as with the lack of understanding of what they know.

Since the accumulated knowledge of mankind threatens to double every ten to fifteen years[10], instructional methods as well as subject content must be receptive to change. Keller[11] advises that release, quest and discovery must replact the old 3-R's----restraint, regurgitation and rote memory.

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[8] United States Department of Labor. MANPOWER, CHALLENGE OF THE 1960's. (Washington: U.S. Government Printing Office), 1961, p. 12.

[9] NEA Project on Instruction, op. cit., p. 122.

[10] Doll, Ronald. CURRICULUM IMPROVEMENT. (Boston: Allyn and Bacon), 1964, p. 74.

[11] Brown, B. Frank. THE NONGRADED HIGH SCHOOL. (Englewood Cliffs: Prentice-Hall), 1963, p. 8.

Because of the explosion of knowledge and the continuous threat of job obsolescence, fact-training must be replaced by concept-training. Much of the new curricular materials emerging from new projects in the various disciplines stresses ultimate rather than immediate practicality. "Concepts become increasingly useful in the affairs of men if seen as part of a whole syntactical structure or discipline."[12]

Isolated facts or skills are of little value if they become obsolete before the learner becomes employable. The school should not attempt to train persons for specific jobs that are only temporarily open. Instead the focus should be on skills that are transferable and will open up various alternatives to the learner. Bruner[13] emphasized that teaching specific topics or skills without identifying their relation in the broad structure of a field is uneconomical.

> In the first place, such teaching makes it exceedingly difficult for the student to generalize from what he has learned to what he will encounter later. In the second place, learning that has fallen short of a grasp of general principles has little reward in terms of intellectual excitement. The best way to create interest in a subject is to render it worth knowing, which means to make the knowledge gained usable in one's thinking beyond the situation in which the learning has occurred. Third, knowledge one has acquired without sufficient structure to tie it together is knowledge that is likely to be forgotten. An unconnected set of facts has a pitiably short half-life in memory. Organizing facts in terms of principles and ideas from which they may be inferred is the only known way of reducing the quick rate of loss of human memory.

With the flexibility demanded of tomorrow's adult and the likelihood of continuous training throughout his productive life, terminal skills have little value in the school curriculum. Instead the Educational Policies Commission[14] urges that development of every student's rational powers must be recognized as of primary importance.

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[12] NEA Project on Instruction. PLANNING AND ORGANIZING FOR TEACHING. (Washington: National Education Association), 1963.

[13] Oregon State Department of Education, op. cit., pp. 5-6.

[14] Educational Policies Commission. THE CENTRAL PURPOSE OF AMERICAN EDUCATION. (Washington: National Education Association), 1961, p. 12.

> The purpose which runs through and strengthens all other educational purposes----the common thread of education----is the development of the ability to think. This is the central purpose to which the school must be oriented if it is to accomplish either its traditional tasks or those newly accentuated by recent changes in the world. To say that it is central is not to say that it is the sole purpose or in all circumstances the most important purpose, but it must be a pervasive concern in the work of the school.

Thus far, attention has been focused on the type of activities that the learner must engage in to prosper in a technological world. Stress has been properly placed on concept acquisition which can be interrelated with other learnings and which can be transferred to resolve subsequent problems that confront the learner. The acquisition of ideas, principles, concepts and methods must become central in the school curriculum.

Criteria for Content Selection

Several authorities have devoted considerable concern to content selection. Content selection should be a most arduous and responsible task if the final results are going to represent the needs of a learner in a technological environment. Phenix[15] advises that "the problem of curriculum is to economize scarce learning potential by making the most judicious and appropriate selection of study content. Human intelligence is too rare and precious a thing to squander on a haphazard program of instruction."

Stratemeyer[16] and others have developed a list of "persistent life situations" calling for growth in individual capacities, in social participation, and in ability to deal with economic-social-political structures and forces to serve as framework for curricular goals.

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[15] Phenix, Phillip H. PHILOSOPHY OF EDUCATION. (New York: Holt, Rinehart and Winston), 1958, p. 59.

[16] Stratemeyer, Florence B. and others DEVELOPING A CURRICULUM FOR MODERN LIVING. (New York: Teachers College, Columbia University), 1957, pp. 155-165.

MASTER LIST OF PERSISTENT LIFE SITUATIONS

Situations Calling for Growth in Individual Capacities

I HEALTH
  A. Satisfying Physiological Needs
  B. Satisfying Emotional and Social Needs
  C. Avoiding and Caring for Illness and Injury
II INTELLECTUAL POWER
  A. Making Ideas Clear
  B. Understanding the Ideas of Others
  C. Dealing with Quantitative Relationships
  D. Using effective Methods of Work
III MORAL CHOICES
  A. Determining the Nature and Extent of Individual Freedom
  B. Determining Responsibility to Self and Others
IV AESTHETIC EXPRESSION AND APPRECIATION
  A. Finding Sources of Aesthetic Satisfactions in Oneself
  B. Achieving Aesthetic Satisfactions through the Environment

Situations Calling for Growth in Social Participation

I PERSON-TO-PERSON RELATIONSHIPS
  A. Establishing Effective Social Relations with Others
  B. Establishing Effective Working Relations with Others
II GROUP MEMBERSHIP
  A. Deciding When to Join a Group
  B. Participating as a Group Member
  C. Taking Leadership Responsibilities
III INTERGROUP RELATIONSHIPS
  A. Working with Racial, Religious, and National Groups
  B. Working with Socio-Economic Groups
  C. Dealing with Groups Organized for Specific Action

Situations Calling for Growth in Ability to Deal with Environmental Factors and Forces

I NATURAL PHENOMENA
  A. Dealing with Physical Phenomena
  B. Dealing with Plant, Animal, and Insect Life
  C. Using Physical and Chemical Forces
II TECHNOLOGICAL RESOURCES
  A. Using Technological Resources
  B. Contributing to Technological Advance
III ECONOMIC-SOCIAL-POLITICAL STRUCTURES AND FORCES
  A. Earning a Living
  B. Securing Goods and Services
  C. Providing for Social Welfare
  D. Molding Public Opinion
  E. Participating in Local and National Government

The National Committee of the Project on Instruction[17] submits a more general set of objectives based upon the condition that education is a process of changing behavior and that members in a changing society must acquire the capacity to learn under their own initiative and adapt to their environment.

Priorities in educational objectives should be placed upon such ends as:
-learning how to learn, how to attack new problems, how to acquire new knowledge
-using rational processes
-building competence in basic skills
-developing intellectual and vocational competence
-exploring values in new experience
-understanding concepts and generalizations

Taba[18], in her list of criteria for content selection, emphasizes the more popular concepts of learning theory as proposed by Bruner.

Criteria for content selection are:

1. Validity and significance of disciplined knowledge
2. Balance of scope and depth
3. Appropriateness to student needs and interests
4. Durability of concepts and ideas
5. Logical relationship to main ideas and basic concepts
6. Integration of knowledge from a variety of disciplines
7. The capacity of the student to master

After examination of the breadth of criteria formulated by curriculum leaders, there appears to be a great need for exercising care in the selection of the elements to be included in the school curricula. Synthesizing the thinking of leaders in the field, one might ask of curriculum content:

1. Does it serve as a core for a number of activities?
2. Will it satisfy future needs?
3. Can the knowledge or skill be placed into a structure?
4. Does the activity incorporate knowledge from other disciplines?
5. Can the concepts attained be transferred to other learning situations?
6. Are the concepts to be attained compatible with more advanced skills or understandings?

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[17] NEA Project on Instruction. SCHOOLS FOR THE 60's. (Washington: National Education Association), 1963, p. 9.

[18] Oregon State Department of Education, op. cit., p.67.

7. Does the skill encourage the development of thought processes?
8. Is the activity stimulating to the growth of the learner?
9. Does the school have a primary educational responsibility in the content area?
10. Does the activity stimulate the development of appropriate appreciations and attitudes?
11. Does the content provide for variation in ability?

Some Implications for Vocational Education

A certain amount of basic conflict exists between a modern concept of a school curriculum as developed on the preceding pages and the current aim of vocational education. Generally vocational education focuses on formal instruction which prepares a person for entrance into and advancement within an occupation or group of related occupations. Construed from a narrow viewpoint, schools should be concerned with providing the learner with saleable skills. Just how specialized the curriculum should be is a moot question. Can a school hope to simulate experiences that the student will face on the job? Or should the school depend upon the student's ability to transfer certain concepts to the employment situation?

Because of the ever-existent threat of obsolescence, it appears that transfer of training or transfer of attitudes and principles is to be preferred over training for specialization. Certain occupations, which are related because of similiarity in needed skills, understandings, or competencies can be logically grouped or "clustered" together. A student will be provided experiences for a cluster of occupations, which will give him the highest degree of flexibility in terms of geographic and occupational mobility.

A Panel of Consultants on Vocational Education[19] submitted the following recommendation for the development of vocational education programs.

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[19] Office of Education. EDUCATION FOR A CHANGING WORLD OF WORK. (Washington: U.S. Government Printing Office), 1963, p. 66.

> The size and scope of the vocational education program should meet the qualitative and quantitative needs of the Nation for trained workers, in a time of rapid technological change, economic growth, and international challenge. This requires a widely diversified program for in-school youth and out-of-school youth and adults, geared to the ever-changing occupational needs of the economy.

Within the above recommendation, one notes terms such as "rapid technological change" and "ever-changing occupational needs." These conditions further suggest the importance of flexibility in preference to specialization.

Haskew and Tumlin[20] foresee the following for development of vocational education programs.

> The first proposition is that the common-school curriculum itself has entered an era of marked transformation....The implication is that issue-resolution concerning vocational education can be bolder, more creative, less hidebound by established doctrine than in the immediate past.
>
> The second proposition is that the common-school program will address itself far more completely than before to a common core of disciplinary content and intellectual prowess....Every offering will face an increased demand to contribute to that core....The development of inductive reasoning, analytical skills, and methods of attack will be objectives consciously sought from all curriculum organization and teaching procedures.
>
> The third proposition is that impending transformation of the common school is toward realistic acceptance of talent utilization as an outcome to be achieved, not merely verbalized as an objective....It seems likely to shift from primary attention to arranged education for work to arranged education to work. Self-assessment and thoughtful long-range relation of the young person to the world of work become important concerns of all teachers and program-builders for the common school....calls for a new definition of vocational education as a pervasive component of that part of schooling devoted to production of a student's life posture.
>
> A fourth proposition is that the transformation will be toward a common school which is a preparatory rather than a finishing school. That is, it prepares for further education on the part of almost every pupil and is oriented in striking degree toward readiness rather than specialization ...it looks toward later completion of job competence and lifelong continuation education in keeping with a constantly revolutionized world of work.
>
> The fifth proposition is that the common school will have its frames of reference transformed. The frame of reference....will be chiefly the socio-economic-cultural enterprise.
>
> The final proposition....The shape of actual transformation in the common school can be affected distinctively by initiative from within.

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[20] Haskew, Laurence D. and Tumlin, Inez W. "Vocational Education in the Common School," VOCATIONAL EDUCATION. (Chicago: National Society for Study of Education), 1965, pp. 81-85.

Criteria for Determining Vocational Education Content

The purpose of this paper has been to explore modern curriculum theory as well as to examine curriculum construction in an attempt to develop appropriate criteria for establishing the content to be included in a modern vocational education program.

CRITERIA FOR DETERMINING UNITS OF INSTRUCTION IN THE VOCATIONAL EDUCATION CURRICULUM

1. Covers an area of skill development which is the prime responsibility of the school.
2. Contributes to the development of a skill which is fundamental to a cluster of occupations.
3. Is related to a structural pattern.
4. Is related to other disciplines.
5. Utilizes general education skills.
6. Is developmental.
7. Encourages or stimulates thinking.
8. Is transferable to new situations.
9. Encourages the development of positive attitudes and appreciations.
10. Is challenging to the learner.
11. Provides for a wide range of abilities.
12. Is of sufficient length to accomplish the educational objectives but short enough to maintain interest.

While each criterion may not be directly pertinent to every learning unit, the creative teacher can construct most experiences to satisfy the conditions. For if the unit does not add to the growth of the learner, then as Bruner[21] says, "the material is cluttering the curriculum."

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[21] Bruner, Jerome. THE PROCESS OF EDUCATION. (New York: Random House), 1960, p. 52.

GLOSSARY OF TERMS

Some of the terms used in discussing what should be taught have a variety of connotations. By delineating the uses of the terms here, the particular intended meaning can be clarified in considering curricular content.

Good[1] states that a:

> *Concept* is an idea or representation of the common element or attribute by which groups or classes can be classified. It is any general or abstract intellectual representation of a situation, state of affairs, or object.
>
> *Discipline* is a branch of knowledge or a course of training designed to develop a mental or physical ability or an attitude.
>
> *Knowledge* is the accumulated facts, truths, principles, and information to which the human mind has access. It is the outcome of specified, rigorous inquiry which originated within the framework of human experience and functions in human experience.
>
> *Principle* is a generalized statement through which otherwise unrelated data are systematized and interpreted.
>
> *Skill* is anything that the individual has learned to do with ease and precision. It may be either a physical or a mental performance.
>
> *Truth* is the correspondence of a thought or judgment with reality, with an actual occurrence, or with natural processes.
>
> *Value* is any characteristic deemed important because of psychological, social, moral, or aesthetic considerations.

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[1] Good, Carter V. *Dictionary of Education* (New York: McGraw-Hill Book Company, 1959).

SKILL OR KNOWLEDGE

1. Oral expression (intonation, enunciation, pleasantness, grammar, etc.)
2. Written expression (grammar, punctuation, vocabularly, spelling, etc.)
3. Reading of technical materials
4. Writing of technical materials
5. Safety principles
6. Filing systems
7. Properties of wood
8. Properties of metal
9. Properties of textiles
10. Properties of stone, brick and concrete
11. Office mach. operation
12. Arithmetic
13. Business mathematics
14. Shop mathematics
15. Elements of algebra
16. Elements of geometry
17. Elements of trigonometry
18. Elements of statistics
19. Negotiable instruments (checks, notes, drafts, etc.)
20. Contracts
21. Titles, warranty deeds, and related sales instruments
22. Basic electricity
23. Basic electronics
24. Principles of heating
25. Principles of pressure
26. Mechanical principles
27. Typewriting
28. Fire fighting procedures
29. Food planning & prep'n
30. Payroll procedures
31. Use of hand tools (wood)
32. Use of hand tools (mech.)
33. Use/hand tools(machinist)
34. Use/wood bench equipment
35. Use/metal bench equipment
36. Use of electrical testing equipment
37. Laboratory procedure
38. Personal grooming
39. Map reading
40. Record keeping
41. Schematic reading
42. Blueprint reading
43. Graph, chart, other visual construction

44. Operation, automotive equip.
45. Maint., automotive equip.
46. Repair, automotive equip.
47. Operator, industrial equip.
48. Maint., industrial equip.
49. Repair of industrial equip.
50. Business correspondence
51. Mechanical drawing
52. Drafting
53. Bookkeeping principles
54. Salesmanship principles (demonstration and selling)
55. Advertising principles
56. Display principles (color, form, balance, etc.)
57. Sanitation principles
58. Shorthand
59. First aid procedures
60. Chemistry symbols
61. Construction principles and codes
62. Construction materials
63. Wood finishing
64. Metal finishing
65. Personnel relations (among subordinates, co-workers and supervisors)
66. Customer relations
67. Soldering
68. Car or truck operation
69. Electric welding
70. Gas weld'g & cutting
71. Superv'n of personnel
72. Mgt. of personnel (interview, selection, promotion, policy formulation)
73. Legible handwriting
74. Speech prep. & delivery
75. Surveying principles
76. Cost estimating
77. Cost analysis
78. Telephone procedures
79. Marketing procedures
80. PBX operation
81. Insurance principles
82. Office procedures
83. Production management
84. Investment principles
85. Leadership ability
86. Workmanship attitudes (enthusiasm, initiative, drive, etc.)

CHAPTER VI

SOURCES OF INFORMATION

RELATED RESEARCH PROJECTS

In order to have the benefit of the most recent developments in the field of labor market analysis and/or employment forecasting and to determine the availability of survey and related data-gathering devices, a search was conducted of Federal and State agencies active in these areas.

The studies or publications which have been reviewed include the following:

Identification or contract number - MDTA	Title of study or project	Author or contractor
32-64	Conference on Methods of Projecting Manpower Supply and Demand (1964)	University of California, Berkeley
19-63	Research Design to Forecast Demand for New Types of Technicians in an Industry (No date)	Georgia Institute of Technology
	An Investigation and Development of the "Cluster" Concept as a Program in Vocational Education at the Secondary School Level (1965)	University of Maryland
	North Carolina Study of Technical and Skilled Manpower (1962)	Bureau of Employment Security, Raleigh, N.C.
	Social Factors Related to Job Satisfaction - A Technique for the Measurement of Job Satisfaction (1952)	Robert Bullock, Ohio State University
	Employment of School Age Youth (1963)	U. S. Department of Labor
	Growth and Characteristics of Part-Time Work Force (1960)	U. S. Department of Labor
	First Interim Report on General Vocational Skills (1964)	American Institute for Research, Pittsburgh

Identification or contract number - MDTA	Title of study or project	Author or contractor
	Unemployment and Job Mobility (1960)	U. S. Department of Labor
	The Manpower Resource of the Portland Metropolitan Area	Department of Employment, Salem, Oregon

An attempt was made to secure additional studies; however, many were out of print, unavailable because final or preliminary reports were not ready for publication or otherwise inaccessible.

Studies which were requested but were unavailable include the following:

Identification or contract number - MDTA	Title of study or project	Author or contractor
20-63	Research Study of Labor Force Trends and Projections in the United States (1965)	National Bureau of Economic Research, New York
29-64	The Changing Skill and Occupational Composition of Employment Opportunities (1965)	Harvard University
41-64	To Develop a Model or Models for Projecting Employment by Industry and by Occupation for Counties, Labor Areas, or SMSA's Together With Appropriate Data (1965)	Temple University
42-64	Methodology for Projection of Selected Occupational Trends in the Denver Standard Metropolitan Statistical Area (1965)	University of Colorado
10-63	Current Population Survey Methods Test Program (1965)	U. S. Bureau of the Census
37-64	A Study of School and Community Factors Related to Vocational School Placement and Employment Performance in Trade and Industry (1956)	American Institute for Research, Pittsburgh

Identification or contract number - MDTA	Title of study or project	Author or contractor
30-64	Conference with School Guidance Counselors (1964)	Women's Bureau, U. S. Department of Labor
34-64	Pilot Program in Manpower Development to Assist School Districts to Modernize in the Face of Technological Change (1965)	National Education Association, Washington, D. C.
18-63	Impediments to Labor Mobility (1964)	University of Utah
19-64	Vocational and Occupational Guidance in the Sixties and Seventies (1964)	Tuskegee Institute

A primary source for many of the studies was the Office of Manpower and Automation Training (OMAT), U.S. Department of Labor. In many cases where OMAT indicated reports were unavailable, a request was made either in writing or by telephone directly to the university or agency conducting the study. All reasonable means were expended in order to acquire studies essential to the task at hand.

SOURCES OF ADDITIONAL INFORMATION

Related to the information produced by the data-collection devices and the employment projections are secondary data pertinent to the study of vocational education planning-implementation-evaluation. The following is an indication of some of the more significant sources of data that are readily available to Oregon educators:

1. Oregon State Department of Employment

a. The following data relative to unemployed workers is available through regional offices of the Oregon State Department of Employment:

(1) Record of principal work experience, including military service, with five most recent employers. The record includes:

(a) Name and address of former employers
(b) Reason for leaving employment
(c) Beginning and termination dates of employment
(d) Rate of pay
(e) Description of job performed to include machines, materials and equipment used

(2) Summary of other work experience.

(3) Education.

(a) Years of school completed
(b) Name of school and courses taken, including military courses, which prepared worker for employment
(c) Length of courses and date courses terminated

(4) Height, weight, age and social security number.

(5) Leisure time activities.

(6) Length of military service.

(7) Union membership to include name, number and affiliation of local union.

(8) Appraisal of physical capacities and notation of physical limitations and/or working conditions, if applicable.

(9) Worker possession of automobile, driver's license, tools and occupational license.

(10) Worker's willingness to accept work in the local area or outside of the local area and his willingness to live at work.

(11) Marital status.

(12) Occupational preferences.

(13) Skills, knowledge and abilities.

b. Results of the General Aptitude Test Battery (GATB) scores for high school students in Oregon are available. The GATB is administered to nearly all students entering the labor market following high school graduation as well as to some students who have made a firm decision to enter college immediately after high school.

The GATB was developed over a period of years by the U. S. Employment Service and measures nine aptitudes which have been found to be necessary for the successful execution of the tasks involved in many different types of work. The battery of tests measures a person's potentiality for acquiring skill--learning to do a job quickly and well.

The nine aptitudes measured by the GATB are:

(1) GENERAL LEARNING ABILITY - Ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school.

(2) VERBAL APTITUDE - The ability to understand the meaning of words and ideas associated with them and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meanings of whole sentences and paragraphs. The ability to present information or ideas clearly.

(3) NUMERICAL APTITUDE - Ability to perform arithmetic operations quickly and accurately.

(4) SPATIAL APTITUDE - Ability to comprehend forms in space and understand relationships of plane and solid objects. May be used in such tasks as blueprint reading and solving geometry problems. Frequently described as the ability to "visualize" objects of two or three dimensions, or to think visually of geometric forms.

(5) FORM PERCEPTION - Ability to perceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons and discriminations and see slight differences in shapes and shading of figures and widths and lengths of lines.

(6) CLERICAL PERCEPTION - Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation.

(7) MOTOR COORDINATION - Ability to coordinate eyes and hands or fingers accurately so as to make precise movements with speed. Ability to control rapid movements of the hand in accordance with what the eye sees. Ability to make a movement response quickly.

(8) FINGER DEXTERITY - Ability to move fingers and manipulate small objects with the fingers rapidly and accurately.

(9) MANUAL DEXTERITY - Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions.

In addition to the main office at Salem, the Oregon State Department of Employment maintains regional offices in the following cities:

1. Albany
2. Astoria
3. Baker
4. Bend
5. Corvallis
6. Eugene
7. Grants Pass
8. Hillsboro
9. Hood River
10. Klamath Falls
11. La Grande
12. Lakeview
13. Lebanon
14. McMinnville
15. Medford
16. Milton-Freewater
17. North Bend
18. Ontario
19. Oregon City
20. Pendleton
21. Portland
22. Roseburg
23. The Dalles
24. Tillamook
25. Toledo

2. The Occupational Outlook Handbook[1]

The Occupational Outlook Handbook (OOH), published biennially and now in its sixth edition, is a useful tool in school guidance and placement programs. Most of the career information is presented in a uniform outline: Nature of Work; Where Employed; Training and Other Qualifications; Employment Outlook; Earnings and Working Conditions; and Where to go for More Information. The comprehensive coverage includes basic information from which the school counselor can deduce values that contribute to job satisfaction. The OOH also enables the counselor to assist the student in considering vocational goals or areas which will utilize his strongest potentials--intelligence, special talents, personality, interests and values.

Reports on different fields of work make up the main body of the book. Separate chapters are grouped into seven major divisions: (1) professional, administrative and related occupations; (2) clerical and sales occupations; (3) service occupations; (4) skilled trades and other manual occupations; (5) some major industries and their occupations; (6) occupations in agriculture; and (7) occupations in government.

Nearly 700 occupations are reported in the OOH including those of greatest interest to young people. Most of the occupations with large numbers of workers are discussed as well as a number of small but rapidly growing fields and occupations of special interest. Collectively, the occupations covered account for about ninety percent of all workers in professional and kindred and sales occupations, nearly as high a proportion in skilled occupations, over half of the clerical and service occupations (outside private households) and a smaller representation in administrative and semiskilled occupations. The main types of farming are also discussed.

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[1] U.S. Bureau of Labor Statistics, Occupational Outlook Handbook, Bulletin No. 1375 (Washington: U. S. Government Printing Office, 1963-64).

An explanation is provided to indicate where each occupation fits into the classification of the *Dictionary of Occupational Titles*.

3. *The Dictionary of Occupational Titles* [2]

A third and completely revised edition of the *Dictionary of Occupational Titles* (DOT) is expected to be available by the end of 1965. Volume I of two volumes consists of job definitions arranged alphabetically. The definitions are based on observation and reanalysis of jobs in all industries during the past three years and include not only what is done, and how and why, but also the functions performed by the worker and the critical physical demands, working conditions, interests, temperaments, training time and attitudes involved.

Volume II contains the occupational classification structure. Jobs are grouped first by some combination of work field, material, product, subject matter, service, generic term, and/or industry. Within each group the jobs are clustered according to kinds of activities performed and skills and abilities required, and are arranged generally in descending order of level of complexity. Also indicated are the worker's involvement with data, people and things which reflect worker functions and worker trait requirements.

More than 20,000 occupations are treated in the new DOT.

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[2] U. S. Department of Labor, *Dictionary of Occupational Titles*, Volume I and II (Washington: U. S. Government Printing Office, 1965).

4. The Fifth Mental Measurements Yearbook[3]

The Yearbook makes available comprehensive and up-to-date information on recent tests published in all English-speaking countries, hundreds of critical test reviews and comprehensive and accurate bibliographies of references on specific tests. The "vocational section" includes tests in the following areas:

Area	Number of Tests
Clerical	11
Interests	15
Manual Dexterity	3
Mechanical Ability	17
Miscellaneous	16
Specific Vocations	51

5. U. S. Bureau of the Census

Numerous reports from the U. S. Bureau of the Census are worthy of consideration when gathering data relative to vocational education. Three specific references have been selected to serve as prototypes of data available from this source.

a. The County and City Data Book[4] provides a convenient reference for selection of recent statistical information for counties, cities and other relatively small geographic areas. For each county, 161 statistical items are presented. Items identical with those for counties are also presented for regions, divisions, states and standard metropolitan statistical areas, except that for the last the data on mineral industries and agriculture are omitted. Population and housing items identical (with minor exceptions) with those for incorporated cities are also presented for urbanized areas and unincorporated places.

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[3] Oscar Buros (ed.), The Fifth Mental Measurements Yearbook (New Jersey: The Gryphon Press, 1959).

[4] U. S. Bureau of the Census, County and City Data Book, 1962, A Statistical Abstract Supplement (Washington: U. S. Government Printing Office, 1962).

Descriptive text and source notes are included to help the user better interpret the figures shown.

b. General Social and Economic Characteristics - Oregon[5] provides inventory statistics on social and economic characteristics of persons enumerated in the 1960 decennial census of population. The characteristics covered in this report include employment status, weeks worked in 1959, class of worker, occupation group, industry group, place of work, and earnings and type of work in 1959.

The tabular data are grouped under three geographic divisions: the state, standard metropolitan statistical areas and urban places of 10,000 or more, and counties and urban places of 2,500-10,000.

Some table headings were extracted from the census report and included here to demonstrate the nature of available data:

Table No.	Title
82	Social characteristics of the population for counties: 1960
83	Education, employment status, and selected labor force characteristics of the population, for counties: 1960
84	Occupation group and class of worker of employed persons, by sex, for counties: 1960
85	Industry group of employed persons and major occupation group of unemployed persons, by sex, for counties: 1960

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[5] U. S. Bureau of the Census, U. S. Census of Population: 1960. General Social and Economic Characteristics, Oregon, Final Report PC (1)-39C (Washington: U. S. Government Printing Office, 1961).

c. U. S. Census report entitled Detailed Characteristics - Oregon[6] presents detailed categories and cross classification on the social and economic characteristics of persons enumerated in the 1960 decennial census of population. The detailed characteristics include employment status, hours worked, weeks worked in 1959, last year worked, occupation, industry, class of worker, earnings and income in 1959, place of work and means of transportation to work.

The major divisions within which the data are presented are: (1) general population, (2) employment status, (3) occupation and industry, and (4) income and place of work.

Some table headings were extracted from the census report and included here to demonstrate the nature of available data:

115	Employment status, by age, color, and sex, for the state, urban and rural, and for standard metropolitan statistical areas and counties of 250,000 or more: 1960
120	Detailed occupation of the experienced civilian labor force and of the employed, by sex, for the state: 1960 and 1950
126	Detailed industry of the experienced civilian labor force and of the employed, by sex, for the state: 1960 and 1950
132	Earnings in 1959 of persons, by place of work of workers during the census week, by state, by type of earnings and class of worker, for the state: 1960

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[6] U. S. Bureau of the Census, U. S. Census of Population: 1960. Detailed Characteristics, Oregon. Final Report PC (1)-39D (Washington: U. S. Government Printing Office, 1962).

6. Monthly Labor Review[7]

In addition to an extensive and authoritative compilation of statistics on population, labor force, employment, earnings, and many other series, the Review carries reports of the United States Department of Labor continuing program of analysis of socio-economic problems related to labor. The most recent issues may be taken as an example of information which might be useful to the analyst of vocational education needs.

a. Monthly Labor Review, June, 1965

   (1) The Rising Levels of Education Among Young Workers, pp. 625-629.

   (2) Special Labor Force Report: Employment of High School Graduates and Dropouts in 1964, pp. 637-644.

b. Monthly Labor Review, July, 1965

   (1) Characteristics and Occupations of the Employed Poor, pp. 828-836.

   (2) Papers From a Conference on Poverty Amidst Affluence, pp. 836-840.

   (3) Special Labor Force Report: Employment of School Age Youth, pp. 851-857.

c. Monthly Labor Review, August, 1965

   (1) Special Labor Force Report: Labor Force Status of Youth, 1964, pp. 932-938.

These three issues are cited only because they are readily available and for illustrative purposes only. A perusal of previous issues will reveal a large number of interesting and useful articles relative to labor force status and training.

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[7] U. S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review (Washington: U. S. Government Printing Office, monthly).

The above material is presented to inform those concerned with vocational education of some of the data related to the world of work. Recognizing that the method of employment of the data will vary with local situations and individual interpretations, the data have not been organized into a conceptual framework for utilization purposes.

The sources cited are not exhaustive. They represent, however, some of the generally acceptable and useful tools in the study of vocational education.

It is recommended that both sections of this report entitled "Sources of Additional Information" and "Bibliography" be supplied to school personnel and other field workers involved in the development of vocational educational programs.

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		Livestock and Products	Agriculture, n.e.c.	Mining	Maintenance and Repair Construction	Food and Kindred Products
1.	Livestock and Products	47,590	24,960	0	0	211,510
2.	Agriculture, n.e.c.	80,420	27,270	0	0	71,940
3.	Mining	80	1,320	2,770	2,330	750
4.	Maintenance and Repair Construction	2,690	5,230	50	20	3,370
5.	Food and Kindred Products	34,030	280	0	0	149,350
6.	Textiles and Apparel	160	1,090	20	30	2,120
7.	Lumber and Wood Products	20	1,410	20	7,430	1,470
8.	Furniture	0	0	0	200	0
9.	Paper and Allied Products	160	210	280	1,210	18,060
10.	Printing and Publishing	60	100	10	20	1,780
11.	Stone, Clay, and Glass Products	50	350	1,740	12,250	8,760
12.	Non-Metal Manufacturing	1,530	29,910	2,130	24,740	12,690
13.	Primary Non-ferrous Metal Manufacturing	10	10	100	5,000	520
14.	Metal Manufacturing	650	770	940	21,830	25,730
15.	Machinery	80	2,750	2,120	1,260	230
16.	Electrical Machinery	90	300	130	5,120	490
17.	Manufacturing, n.e.c.	290	720	140	1,150	440
18.	Transportation	5,930	3,820	420	5,300	36,980
19.	Communications	610	1,050	70	320	2,290
20.	Electricity, Water, Gas, and Sanitary Services	1,050	2,390	980	440	5,120
21.	Wholesale and Retail Trade	10,460	13,970	1,310	24,510	32,700
22.	Finance, Insurance, and Real Estate	5,520	29,450	2,260	1,500	9,070
23.	Hotels and Repair Services	0	0	40	0	540
24.	Business Services	530	11,900	490	1,070	23,090
25.	Automotive Services	690	700	50	400	4,060
26.	Medical and Educational Services	1,730	180	40	170	1,050
27.	Services, n.e.c.	0	0	0	0	90
28.	Government Enterprise	50	70	60	40	860
29.	Activities, n.e.c.	210	420	360	920	5,370
30.	Value Added	105,310	174,370	23,470	182,740	289,570
31.	Total	300,000	335,000	40,000	300,000	920,000

TABLE 1

Interindustry Transactions, 1963

Food and Kindred Products	Textiles and Apparel	Lumber and Wood Products	Furniture	Paper and Allied Products	Printing and Publishing	Stone, Clay, and Glass Products	Non-Metal Manufacturing	Primary Non-ferrous Metal Manufacturing	Metal Manufacturing	Machinery
211,510	570	0	0	0	0	0	1,340	0	0	0
71,940	3,370	63,170	0	0	0	70	200	0	0	20
750	50	130	40	6,600	0	10,080	20,580	33,730	8,590	110
3,370	70	1,000	30	2,970	600	60	420	140	800	470
149,350	150	10	470	4,040	0	100	4,960	30	40	30
2,120	68,610	880	4,050	5,760	250	330	5,410	1,110	440	430
1,470	0	160,920	7,140	35,250	10	720	500	410	1,120	540
0	130	1,190	1,010	90	70	30	20	0	270	70
18,060	1,530	6,130	1,320	222,530	30,200	5,160	6,060	1,390	2,290	540
1,780	140	2,070	20	6,800	21,550	280	690	360	480	150
8,760	80	2,750	1,110	3,030	0	18,650	1,990	1,920	3,130	2,430
12,690	7,710	18,950	3,720	41,110	2,880	8,420	89,760	11,530	6,740	5,650
520	10	630	530	770	200	280	1,340	121,710	13,860	10,740
25,730	220	6,550	5,860	8,280	330	2,420	8,410	13,040	85,570	38,280
230	160	2,080	360	3,610	580	450	1,450	5,760	9,820	39,810
490	10	730	170	1,050	170	660	400	6,250	3,280	10,740
440	2,300	1,360	390	1,090	1,480	450	960	1,610	4,210	7,470
36,980	1,790	25,250	1,300	26,580	2,520	7,800	8,830	8,030	8,590	3,160
2,290	410	1,430	310	2,050	2,170	480	1,040	1,120	950	1,670
5,120	700	3,640	350	11,010	740	4,100	3,760	8,730	3,820	1,610
32,700	5,470	22,890	3,310	28,850	4,040	4,260	8,860	12,590	10,550	10,290
9,070	2,470	7,140	1,040	9,020	7,880	2,500	5,180	4,020	3,800	5,030
540	330	1,030	120	810	230	210	230	300	370	390
23,090	1,350	3,090	970	8,130	7,590	2,020	6,320	3,150	3,230	3,620
4,060	60	4,310	100	600	180	430	300	240	180	270
1,050	170	570	70	750	190	150	290	370	300	270
90	10	20	0	120	10	20	300	210	120	40
860	260	580	50	1,450	1,230	320	810	310	390	360
5,370	1,280	4,390	570	13,790	4,380	1,760	3,250	2,060	5,820	3,920
289,570	50,590	182,110	25,590	273,860	80,520	67,790	116,340	129,880	121,240	127,000
920,000	150,000	525,000	60,000	720,000	170,000	140,000	300,000	370,000	300,000	275,000

TABLE 1

lustry Transactions, 1963

Metal Manufacturing	Machinery	Electrical Machinery	Manufacturing, n.e.c.	Transportation	Communications	Electricity, Water, Gas, and Sanitary Services	Wholesale and Retail Trade	Finance, Insurance, and Real Estate	Hotels and Repair Services	Business Services
0	0	0	0	30	0	0	0	8,650	0	0
0	20	0	220	560	0	0	2,010	12,690	0	0
8,590	110	250	330	450	0	25,250	100	1,510	0	340
800	470	360	870	19,510	4,200	8,160	10,180	57,510	580	250
40	30	0	270	1,570	0	10	6,990	620	220	0
440	430	430	5,520	650	190	30	1,640	930	6,160	460
1,120	540	410	4,830	410	0	40	1,960	250	80	0
270	70	360	1,040	0	0	0	240	40	240	0
2,290	540	3,400	9,360	660	130	250	10,650	1,240	2,700	850
480	150	310	690	20	1,670	80	3,090	3,830	110	60,360
3,130	2,430	3,080	6,480	150	0	350	2,960	250	900	0
6,740	5,650	7,760	23,760	30,250	370	3,940	16,180	6,500	8,130	2,480
13,860	10,740	19,090	12,500	760	320	130	200	110	100	180
85,570	38,280	23,560	57,700	1,480	40	3,210	2,880	430	460	10
9,820	39,810	9,780	16,820	2,070	0	180	3,190	1,070	670	9,630
3,280	10,740	37,840	17,410	2,400	2,210	250	2,480	480	6,220	50
4,210	7,470	7,150	83,010	5,310	310	130	6,360	940	7,280	5,300
8,590	3,160	3,420	7,880	42,520	260	5,510	5,200	5,720	1,480	1,290
950	1,670	1,120	1,680	4,240	2,760	690	12,830	5,720	1,060	23,600
3,820	1,610	1,860	2,510	2,300	880	51,370	24,650	3,450	3,860	2,820
10,550	10,290	9,410	20,020	18,000	920	3,560	21,160	12,480	8,540	4,830
3,800	5,030	3,580	6,290	26,940	4,050	2,460	86,960	95,820	12,500	13,620
370	390	370	580	0	0	0	3,630	3,030	6,570	1,390
3,230	3,620	4,250	11,110	7,770	3,080	3,340	63,400	20,890	5,180	6,280
180	270	120	350	12,120	230	370	10,240	1,800	1,900	1,340
300	270	290	510	490	140	240	1,350	1,730	190	40
120	40	30	210	390	3,920	0	1,250	970	0	380
390	360	750	810	12,800	610	45,630	17,960	9,960	420	7,610
5,820	3,920	6,070	5,580	2,950	1,560	1,130	26,060	5,000	3,570	5,280
21,240	127,000	139,950	201,550	323,200	122,150	143,690	904,200	556,380	120,880	131,610
00,000	275,000	285,000	500,000	520,000	150,000	300,000	1,250,000	820,000	200,000	280,000

Hotels and Repair Services	Business Services	Automotive Services	Medical and Educational Services	Services, n.e.c.	Government Enterprise	Activities, n.e.c.	Intermediate Domestic Demand	Total Final Demand	Total Domestic Output Independent	
0	0	0	70	150	50	80	295,000	5,000	300,000	1
0	0	0	80	40	17,690	250	280,000	55,000	335,000	2
0	340	160	0	10	4,440	0	120,000	-80,000	40,000	3
580	250	1,640	10,490	1,790	36,540	0	170,000	130,000	300,000	4
220	0	0	2,620	50	7,600	6,560	220,000	700,000	920,000	5
6,160	460	540	1,510	220	170	860	110,000	40,000	150,000	6
80	0	0	50	0	0	10	225,000	300,000	525,000	7
240	0	0	0	0	0	0	5,000	55,000	60,000	8
2,700	850	60	1,620	170	1,040	20,800	350,000	370,000	720,000	9
110	60,360	150	4,970	290	360	49,560	160,000	10,000	170,000	10
900	0	2,070	100	10	360	50	75,000	65,000	140,000	11
8,130	2,480	5,610	11,250	2,370	2,430	1,500	390,000	-90,000	300,000	12
100	180	0	0	170	0	730	190,000	180,000	370,000	13
460	10	1,720	320	550	810	2,950	315,000	-15,000	300,000	14
670	9,630	1,610	50	2,640	50	1,720	120,000	155,000	275,000	15
6,220	50	2,380	350	12,170	60	1,110	115,000	170,000	285,000	16
7,280	5,300	17,590	5,940	40,240	660	15,720	220,000	280,000	500,000	17
1,480	1,290	1,130	1,850	350	23,490	8,600	255,000	265,000	520,000	18
1,060	23,600	840	2,930	470	1,090	0	75,000	75,000	150,000	19
3,860	2,820	2,290	6,440	600	13,530	0	165,000	135,000	300,000	20
8,540	4,830	10,180	6,480	1,160	3,090	1,110	315,000	935,000	1,250,000	21
12,500	13,620	7,840	28,070	6,130	4,860	0	395,000	425,000	820,000	22
6,570	1,390	0	1,700	0	220	2,910	25,000	175,000	200,000	23
5,180	6,280	2,330	8,830	3,300	3,690	0	220,000	60,000	280,000	24
1,900	1,340	2,020	750	0	1,190	0	45,000	75,000	120,000	25
190	40	120	5,440	8,040	10	110	25,000	325,000	350,000	26
0	380	0	1,900	19,600	40	370	30,000	120,000	150,000	27
420	7,610	380	430	60	5,740	0	110,000	155,000	265,000	28
3,570	5,280	1,590	8,190	1,530	2,990	0	120,000	-5,000	115,000	29
120,880	131,610	57,750	237,570	47,890	132,800	0	5,070,000	930,000	6,000,000	30
200,000	280,000	120,000	350,000	150,000	265,000	115,000		6,000,000		31

TABLE 2
Final Demand

		Intermediate Domestic Demand	Personal Consumption	Investment	Government
1.	Livestock and Products	295,000	30,000	0	0
2.	Agriculture, n.e.c.	280,000	40,000	0	-35,000
3.	Mining	120,000	5,000	0	0
4.	Maintenance and Repair Construction	170,000	60,000	0	40,000
5.	Food and Kindred Products	220,000	680,000	0	30,000
6.	Textiles and Apparel	110,000	190,000	0	0
7.	Lumber and Wood Products	225,000	15,000	55,000	10,000
8.	Furniture	5,000	40,000	20,000	10,000
9.	Paper and Allied Products	350,000	25,000	0	5,000
10.	Printing and Publishing	160,000	40,000	0	10,000
11.	Stone, Clay, and Glass Products	75,000	5,000	50,000	0
12.	Non-Metal Manufacturing	390,000	200,000	25,000	15,000
13.	Primary Non-ferrous Metal Manufacturing	190,000	0	10,000	20,000
14.	Metal Manufacturing	315,000	10,000	120,000	10,000
15.	Machinery	120,000	15,000	150,000	20,000
16.	Electrical Machinery	115,000	65,000	50,000	30,000
17.	Manufacturing, n.e.c.	220,000	180,000	75,000	150,000
18.	Transportation	255,000	250,000	40,000	20,000
19.	Communications	75,000	70,000	5,000	5,000
20.	Electricity, Water, Gas, and Sanitary Services	165,000	120,000	10,000	10,000
21.	Wholesale and Retail Trade	315,000	830,000	80,000	10,000
22.	Finance, Insurance, and Real Estate	295,000	640,000	30,000	10,000
23.	Hotels and Repair Services	25,000	150,000	0	5,000
24.	Business Services	220,000	25,000	35,000	15,000
25.	Automotive Services	45,000	60,000	0	5,000
26.	Medical and Educational Services	25,000	290,000	0	10,000
27.	Services, n.e.c.	30,000	45,000	0	65,000
28.	Government Enterprise	110,000	75,000	20,000	50,000
29.	Activities, n.e.c.	120,000	5,000	0	5,000
30.	Value Added	5,070,000	90,000	375,000	525,000
31.	Total		4,250,000	1,150,000	1,050,000

TABLE 2
Final Demand

	Intermediate Domestic Demand	Personal Consumption	Investment	Government	Domestic Final Demand	Net External Trade Balance	Total Final Demand	Total Domestic Output	
	295,000	30,000	0	0	30,000	-25,000	5,000	300,000	1
	280,000	40,000	0	-35,000	5,000	+50,000	55,000	335,000	2
	120,000	5,000	0	0	5,000	-85,000	-80,000	40,000	3
	170,000	60,000	0	40,000	100,000	+30,000	130,000	300,000	4
	220,000	680,000	0	30,000	710,000	-10,000	700,000	920,000	5
	110,000	190,000	0	0	190,000	-150,000	40,000	150,000	6
	225,000	15,000	55,000	10,000	80,000	+220,000	300,000	525,000	7
	5,000	40,000	20,000	10,000	70,000	-15,000	55,000	60,000	8
	350,000	25,000	0	5,000	30,000	+340,000	370,000	720,000	9
	160,000	40,000	0	10,000	50,000	-40,000	10,000	170,000	10
	75,000	5,000	50,000	0	55,000	+10,000	65,000	140,000	11
	390,000	200,000	25,000	15,000	240,000	-330,000	-90,000	300,000	12
	190,000	0	10,000	20,000	30,000	+150,000	180,000	370,000	13
	315,000	10,000	120,000	10,000	140,000	-155,000	-15,000	300,000	14
	120,000	15,000	150,000	20,000	185,000	-30,000	155,000	275,000	15
	115,000	65,000	50,000	30,000	145,000	+25,000	170,000	285,000	16
	220,000	180,000	75,000	150,000	405,000	-125,000	280,000	500,000	17
	255,000	250,000	40,000	20,000	310,000	-45,000	265,000	520,000	18
	75,000	70,000	5,000	5,000	80,000	-5,000	75,000	150,000	19
ervices	165,000	120,000	10,000	10,000	140,000	-5,000	135,000	300,000	20
	315,000	830,000	80,000	10,000	950,000	+15,000	935,000	1,250,000	21
	295,000	640,000	30,000	10,000	680,000	-255,000	425,000	820,000	22
	25,000	150,000	0	5,000	155,000	+20,000	175,000	200,000	23
	220,000	25,000	35,000	15,000	75,000	-15,000	60,000	280,000	24
	45,000	60,000	0	5,000	65,000	+10,000	75,000	120,000	25
	25,000	290,000	0	10,000	300,000	+25,000	325,000	350,000	26
	30,000	45,000	0	65,000	110,000	+10,000	120,000	150,000	27
	110,000	75,000	20,000	50,000	145,000	+10,000	155,000	265,000	28
	120,000	5,000	0	5,000	10,000	-15,000	-5,000	115,000	29
	5,070,000	90,000	375,000	525,000	990,000	-60,000	930,000	6,000,000	30
		4,250,000	1,150,000	1,050,000	6,450,000	-450,000	6,000,000		31

		Livestock and Products	Agriculture, n.e.c.	Mining	Maintenance and Repair Construction	Food and Kindred Products	
1.	Livestock and Products	.15863	.07451	.00000	.00000	.22991	.00
2.	Agriculture, n.e.c.	.26806	.08140	.00000	.00000	.07820	.02
3.	Mining	.00027	.00394	.06925	.00777	.00082	.00
4.	Maintenance and Repair Construction	.00897	.01561	.00125	.00007	.00366	.00
5.	Food and Kindred Products	.11343	.00084	.00000	.00000	.16234	.00
6.	Textiles and Apparel	.00053	.00325	.00050	.00010	.00230	.45
7.	Lumber and Wood Products	.00007	.00421	.00050	.02477	.00160	.00
8.	Furniture	.00000	.00000	.00000	.00067	.00000	.00
9.	Paper and Allied Products	.00053	.00063	.00700	.00403	.01963	.01
10.	Printing and Publishing	.00020	.00030	.00025	.00007	.00193	.00
11.	Stone, Clay, and Glass Products	.00017	.00104	.04350	.04083	.00952	.00
12.	Non-Metal Manufacturing	.00510	.08928	.05325	.08247	.01379	.05
13.	Primary Non-ferrous Metal Manufacturing	.00003	.00003	.00250	.01667	.00057	.00
14.	Metal Manufacturing	.00217	.00230	.02350	.07277	.02797	.00
15.	Machinery	.00027	.00821	.05300	.00420	.00025	.00
16.	Electrical Machinery	.00030	.00090	.00325	.01707	.00053	.00
17.	Manufacturing, n.e.c.	.00097	.00215	.00350	.00383	.00049	.01
18.	Transportation	.01977	.01140	.01050	.01767	.04020	.01
19.	Communications	.00203	.00313	.00175	.00107	.00249	.00
20.	Electricity, Water, Gas, and Sanitary Services	.00350	.00713	.02450	.00147	.00557	.00
21.	Wholesale and Retail Trade	.03487	.04170	.03275	.08170	.03554	.03
22.	Finance, Insurance, and Real Estate	.01840	.08791	.05650	.00500	.00986	.01
23.	Hotels and Repair Services	.00000	.00000	.00100	.00000	.00059	.00
24.	Business Services	.00177	.03552	.01225	.00357	.02510	.00
25.	Automotive Services	.00230	.00209	.00125	.00133	.00441	.00
26.	Medical and Educational Services	.00577	.00054	.00100	.00057	.00114	.00
27.	Services, n.e.c.	.00000	.00000	.00000	.00000	.00010	.00
28.	Government Enterprise	.00010	.00021	.00150	.00013	.00093	.00
29.	Activities, n.e.c.	.00070	.00125	.00900	.00307	.00584	.00

TABLE 3
Direct Requirements

Food and Kindred Products	Textiles and Apparel	Lumber and Wood Products	Furniture	Paper and Allied Products	Printing and Publishing	Stone, Clay, and Glass Products	Non-Metal Manufacturing	Primary Non-Ferrous Metal Manufacturing	Metal Manufacturing	Machinery	Electrical Machinery
.22991	.00380	.00000	.00000	.00000	.00000	.00000	.00447	.00000	.00000	.00000	.00000
.07820	.02247	.12033	.00000	.00000	.00000	.00050	.00067	.00000	.00000	.00007	.00000
.00082	.00033	.00025	.00067	.00917	.00000	.07200	.06860	.09116	.02863	.00040	.00088
.00366	.00047	.00190	.00050	.00413	.00353	.00043	.00140	.00038	.00267	.00171	.00126
.16234	.00100	.00002	.00783	.00561	.00000	.00071	.01653	.00008	.00013	.00011	.00000
.00230	.45740	.00168	.06750	.00800	.00147	.00236	.01803	.00300	.00147	.00156	.00151
.00160	.00000	.30652	.11900	.04896	.00006	.00514	.00167	.00111	.00373	.00196	.00144
.00000	.00087	.00227	.01683	.00013	.00041	.00021	.00007	.00000	.00090	.00025	.00126
.01963	.01020	.01168	.02200	.30907	.17765	.03686	.02020	.00376	.00763	.00196	.01193
.00193	.00093	.00394	.00033	.00944	.12677	.00200	.00230	.00097	.00160	.00055	.00109
.00952	.00053	.00524	.01850	.00421	.00000	.13322	.00663	.00519	.01043	.00884	.01081
.01379	.05140	.03610	.06200	.05710	.01694	.06014	.29920	.03116	.02247	.02055	.02722
.00057	.00007	.00120	.00883	.00107	.00118	.00200	.00447	.32895	.04620	.03905	.06698
.02797	.00147	.01248	.09767	.01150	.00194	.01729	.02803	.03524	.28523	.13920	.08267
.00025	.00107	.00396	.00600	.00501	.00341	.00321	.00438	.01557	.03273	.14477	.03432
.00053	.00007	.00139	.00283	.00146	.00100	.00471	.00133	.01689	.01093	.03905	.13277
.00049	.01533	.00259	.00650	.00151	.00871	.00321	.00320	.00435	.01403	.02716	.06018
.04020	.01193	.04810	.02167	.03692	.01482	.05571	.02943	.02170	.02863	.01149	.01200
.00249	.00273	.00272	.00517	.00285	.01276	.00343	.00347	.00303	.00317	.00607	.00393
.00557	.00467	.00693	.00583	.01529	.00435	.02929	.01253	.02359	.01273	.00585	.00653
.03554	.03647	.04360	.05517	.04007	.02376	.03043	.02953	.03403	.03517	.03742	.03302
.00986	.01647	.01360	.01733	.01253	.04635	.01786	.01727	.01086	.01267	.01829	.01256
.00059	.00220	.00196	.00200	.00113	.00135	.00150	.00077	.00081	.00123	.00142	.00130
.02510	.00900	.00589	.01617	.01129	.04465	.01443	.02107	.00851	.01077	.01316	.01491
.00441	.00040	.00821	.00167	.00083	.00106	.00307	.00100	.00065	.00060	.00098	.00042
.00114	.00113	.00109	.00117	.00104	.00112	.00107	.00097	.00100	.00100	.00098	.00102
.00010	.00007	.00004	.00000	.00017	.00006	.00014	.00100	.00057	.00040	.00015	.00011
.00093	.00173	.00110	.00083	.00201	.00724	.00229	.00270	.00084	.00130	.00131	.00263
.00584	.00853	.00836	.00950	.01915	.02576	.01257	.01083	.00557	.01940	.01425	.02130

Machinery	Electrical Machinery	Manufacturing, n.e.c.	Transportation	Communications	Electricity, Water, Gas, and Sanitary Services	Wholesale and Retail Trade	Finance, Insurance, and Real Estate	Hotels and Repair Services	Business Services	Automotive Services	Medical and Educational Services
.00000	.00000	.00000	.00006	.00000	.00000	.00000	.01055	.00000	.00000	.00000	.00020
.00007	.00000	.00044	.00108	.00000	.00000	.00161	.01548	.00000	.00000	.00000	.00023
.00040	.00088	.00066	.00087	.00000	.08417	.00008	.00184	.00000	.00121	.00133	.00000
.00171	.00126	.00174	.03752	.02800	.02720	.00814	.07013	.00290	.00089	.01367	.02997
.00011	.00000	.00054	.00302	.00000	.00003	.00559	.00076	.00110	.00000	.00000	.00749
.00156	.00151	.01104	.00125	.00127	.00010	.00131	.00113	.03080	.00164	.00450	.00431
.00196	.00144	.00966	.00079	.00000	.00013	.00157	.00030	.00040	.00000	.00000	.00014
.00025	.00126	.00208	.00000	.00000	.00000	.00019	.00005	.00120	.00000	.00000	.00000
.00196	.01193	.01872	.00127	.00087	.00083	.00852	.00151	.01350	.00304	.00050	.00463
.00055	.00109	.00138	.00004	.01113	.00027	.00247	.00467	.00055	.21557	.00125	.01420
.00884	.01081	.01296	.00029	.00000	.00117	.00237	.00030	.00450	.00000	.01725	.00029
.02055	.02722	.04752	.05817	.00247	.01313	.01294	.00793	.04065	.00886	.04675	.03214
.03905	.06698	.02500	.00146	.00213	.00043	.00016	.00013	.00050	.00064	.00000	.00000
.13920	.08267	.11540	.00285	.00027	.01070	.00230	.00052	.00230	.00004	.01433	.00091
.14477	.03432	.03364	.00398	.00000	.00060	.00255	.00130	.00335	.03439	.01342	.00014
.03905	.13277	.03482	.00462	.01423	.00083	.00198	.00059	.03110	.00018	.01983	.00100
.02716	.06018	.16602	.01021	.00207	.00043	.00509	.00115	.03640	.01893	.14658	.01697
.01149	.01200	.01576	.08177	.00173	.01837	.00416	.00698	.00740	.00461	.00942	.00529
.00607	.00393	.00336	.00815	.01840	.00230	.01026	.00698	.00530	.08429	.00700	.00837
.00585	.00653	.00502	.00442	.00587	.17123	.01972	.00421	.01930	.01007	.01908	.01840
.03742	.03302	.04004	.03462	.00613	.01187	.01693	.01522	.04270	.01725	.08483	.01851
.01829	.01256	.01258	.05181	.02700	.00820	.06957	.11685	.06250	.04864	.06533	.08020
.00142	.00130	.00116	.00000	.00000	.00000	.00290	.00370	.03285	.00496	.00000	.00486
.01316	.01491	.02222	.01494	.02053	.01113	.05072	.02548	.02590	.02243	.01942	.02523
.00098	.00042	.00070	.02331	.00153	.00123	.00819	.00220	.00950	.00479	.01683	.00214
.00098	.00102	.00102	.00094	.00093	.00080	.00108	.00211	.00095	.00014	.00100	.01554
.00015	.00011	.00042	.00075	.02613	.00000	.00100	.00118	.00000	.00136	.00000	.00543
.00131	.00263	.00162	.02462	.00407	.15210	.01437	.01215	.00210	.02718	.00317	.00123
.01425	.02130	.01116	.00567	.01040	.00377	.02085	.00610	.01785	.01886	.01325	.02340

Transportation	Communications	Electricity, Water, Gas, and Sanitary Services	Wholesale and Retail Trade	Finance, Insurance, and Real Estate	Hotels and Repair Services	Business Services	Automotive Services	Medical and Educational Services	Services, n.e.c.	Government Enterprise	Activities, n.e.c.	
006	.00000	.00000	.00000	.01055	.00000	.00000	.00000	.00020	.00100	.00019	.00070	1
108	.00000	.00000	.00161	.01548	.00000	.00000	.00000	.00023	.00027	.06675	.00217	2
087	.00000	.08417	.00008	.00184	.00000	.00121	.00133	.00000	.00007	.01675	.00000	3
752	.02800	.02720	.00814	.07013	.00290	.00089	.01367	.02997	.01193	.13789	.00000	4
302	.00000	.00003	.00559	.00076	.00110	.00000	.00000	.00749	.00033	.02868	.05704	5
125	.00127	.00010	.00131	.00113	.03080	.00164	.00450	.00431	.00147	.00064	.00748	6
079	.00000	.00013	.00157	.00030	.00040	.00000	.00000	.00014	.00000	.00000	.00009	7
000	.00000	.00000	.00019	.00005	.00120	.00000	.00000	.00000	.00000	.00000	.00000	8
127	.00087	.00083	.00852	.00151	.01350	.00304	.00050	.00463	.00113	.00392	.18087	9
004	.01113	.00027	.00247	.00467	.00055	.21557	.00125	.01420	.00193	.00136	.43096	10
029	.00000	.00117	.00237	.00030	.00450	.00000	.01725	.00029	.00007	.00136	.00043	11
817	.00247	.01313	.01294	.00793	.04065	.00886	.04675	.03214	.01580	.00917	.01304	12
146	.00213	.00043	.00016	.00013	.00050	.00064	.00000	.00000	.00113	.00000	.00635	13
285	.00027	.01070	.00230	.00052	.00230	.00004	.01433	.00091	.00367	.00306	.02565	14
398	.00000	.00060	.00255	.00130	.00335	.03439	.01342	.00014	.01760	.00019	.01496	15
462	.01423	.00083	.00198	.00059	.03110	.00018	.01983	.00100	.08113	.00023	.00965	16
021	.00207	.00043	.00509	.00115	.03640	.01893	.14658	.01697	.26827	.00249	.13670	17
177	.00173	.01837	.00416	.00698	.00740	.00461	.00942	.00529	.00233	.08864	.07478	18
815	.01840	.00230	.01026	.00698	.00530	.08429	.00700	.00837	.00313	.00411	.00000	19
442	.00587	.17123	.01972	.00421	.01930	.01007	.01908	.01840	.00400	.05106	.00000	20
462	.00613	.01187	.01693	.01522	.04270	.01725	.08483	.01851	.00773	.01166	.00965	21
181	.02700	.00820	.06957	.11685	.06250	.04864	.06533	.08020	.04087	.01834	.00000	22
000	.00000	.00000	.00290	.00370	.03285	.00496	.00000	.00486	.00000	.00083	.02530	23
494	.02053	.01113	.05072	.02548	.02590	.02243	.01942	.02523	.02200	.01392	.00000	24
331	.00153	.00123	.00819	.00220	.00950	.00479	.01683	.00214	.00000	.00449	.00000	25
094	.00093	.00080	.00108	.00211	.00095	.00014	.00100	.01554	.05360	.00004	.00097	26
075	.02613	.00000	.00100	.00118	.00000	.00136	.00000	.00543	.13067	.00015	.00322	27
462	.00407	.15210	.01437	.01215	.00210	.02718	.00317	.00123	.00040	.02166	.00000	28
567	.01040	.00377	.02085	.00610	.01785	.01886	.01325	.02340	.01020	.01128	.00000	29

		Livestock and Products	Agriculture, n.e.c.	Mining	Maintenance and Repair Construction
1.	Livestock and Products	1.27277	.10814	.00361	.00354
2.	Agriculture, n.e.c.	.38975	1.12691	.00507	.00844
3.	Mining	.01228	.02153	1.09531	.03312
4.	Maintenance and Repair Construction	.02930	.03226	.01329	1.00746
5.	Food and Kindred Products	.17626	.02089	.00522	.00576
6.	Textiles and Apparel	.00869	.01425	.00726	.00793
7.	Lumber and Wood Products	.00610	.01045	.00523	.04018
8.	Furniture	.00013	.00016	.00021	.00103
9.	Paper and Allied Products	.01804	.01805	.03035	.02574
10.	Printing and Publishing	.01493	.02119	.01825	.01383
11.	Stone, Clay, and Glass Products	.00649	.00679	.05906	.05363
12.	Non-Metal Manufacturing	.08084	.16429	.10766	.14742
13.	Primary Non-ferrous Metal Manufacturing	.00497	.00609	.01629	.03946
14.	Metal Manufacturing	.02468	.02351	.06498	.12451
15.	Machinery	.00961	.01834	.07497	.01735
16.	Electrical Machinery	.00413	.00504	.01109	.02536
17.	Manufacturing, n.e.c.	.00980	.01119	.01582	.01582
18.	Transportation	.04948	.03076	.03060	.04033
19.	Communications	.01010	.01216	.00784	.00660
20.	Electricity, Water, Gas, and Sanitary Services	.01699	.01918	.04245	.01521
21.	Wholesale and Retail Trade	.08212	.07083	.05644	.01628
22.	Finance, Insurance, and Real Estate	.08532	.13437	.08811	.03080
23.	Hotels and Repair Services	.00136	.00166	.00280	.00158
24.	Business Services	.03301	.05645	.02771	.02001
25.	Automotive Services	.00719	.00518	.00366	.00438
26.	Medical and Educational Services	.00851	.00213	.00197	.00148
27.	Services, n.e.c.	.00084	.00102	.00078	.00078
28.	Government Enterprise	.00813	.00922	.01271	.00718
29.	Activities, n.e.c.	.00899	.00985	.01879	.01392
30.	Total	2.38081	1.96189	1.82753	1.72913

TABLE 4
Direct & Indirect Requirements

Maintenance and Repair Construction	Food and Kindred Products	Textiles and Apparel	Lumber and Wood Products	Furniture	Paper and Allied Products	Printing and Publishing	Stone, Clay, and Glass Products	Non-Metal Manufacturing	Primary Non-ferrous Metal Manufacturing
.00354	.36134	.01794	.02179	.00984	.00852	.00470	.00434	.01977	.00327
.00844	.21559	.05460	.19973	.03368	.02122	.00877	.00758	.01485	.00503
.03312	.01576	.01785	.01752	.02539	.03385	.01344	.10932	.11877	.16649
1.00746	.02312	.01194	.01886	.01236	.01853	.01826	.01367	.01426	.01220
.00576	1.24751	.01124	.00905	.01740	.01832	.00858	.00798	.03530	.00563
.00793	.01249	1.85228	.01333	.13600	.02992	.01312	.01310	.05242	.01474
.04018	.01020	.00614	1.44911	.18203	.10689	.02483	.01648	.01020	.00692
.00103	.00020	.00185	.00352	1.01795	.00063	.00074	.00046	.00036	.00029
.02574	.05444	.04940	.04580	.06198	1.48062	.32341	.08385	.06520	.02938
.01383	.02688	.02466	.02720	.02546	.04561	1.18875	.02545	.03032	.02075
.05363	.01867	.00598	.01403	.02986	.01354	.00534	1.16327	.02082	.02203
.14742	.08232	.16415	.12810	.14489	.15451	.07499	.13675	1.46837	.10511
.03946	.00919	.00685	.01026	.03061	.01072	.00867	.01232	.01971	1.50696
.12451	.06565	.02607	.04536	.16618	.04686	.02561	.05150	.07830	.10598
.01735	.01153	.01093	.01676	.02263	.01867	.01487	.01872	.02413	.04753
.02536	.00559	.00502	.00750	.01079	.00766	.00654	.01142	.00811	.03633
.01582	.01298	.04391	.01798	.02499	.01751	.02660	.01700	.01922	.02243
.04033	.07976	.04107	.09434	.05811	.08286	.04632	.09016	.06551	.05494
.00660	.01294	.01173	.01148	.01388	.01169	.02496	.01081	.01293	.01122
.01521	.02163	.02056	.02419	.02348	.03865	.01981	.05399	.03494	.05753
.01628	.08673	.08965	.09443	.09735	.08682	.05769	.06159	.06938	.07835
.03080	.06694	.06170	.06806	.05533	.05091	.08580	.05314	.05888	.05072
.00158	.00243	.00595	.00464	.00478	.00407	.00433	.00361	.00317	.00308
.02001	.05478	.03445	.03215	.03826	.03509	.06930	.03324	.04691	.03012
.00438	.01049	.00356	.01647	.00667	.00584	.00433	.00744	.00492	.00411
.00148	.00448	.00305	.00270	.00264	.00262	.00244	.00225	.00258	.00260
.00078	.00113	.00113	.00105	.00115	.00133	.00153	.00112	.00257	.00188
.00718	.01118	.01158	.01194	.01090	.01529	.01810	.01708	.01521	.01550
.01392	.01717	.02464	.02172	.02480	.03854	.04350	.02495	.02615	.01995
1.72913	2.54312	2.61988	2.42907	2.28939	2.40729	2.14533	2.05259	2.34326	2.44107

TABLE 4
direct Requirements

	Primary Non-ferrous Metal Manufacturing	Metal Manufacturing	Machinery	Electrical Machinery	Manufacturing, n.e.c.	Transportation	Communications	Electricity, Water, Gas, and Sanitary Services	Wholesale and Retail Trade	Finance, Insurance, and Real Estate
7	.00327	.00341	.00299	.00328	.00424	.00515	.00151	.00523	.00533	.01877
5	.00503	.00569	.00479	.00512	.00854	.00861	.00251	.01812	.00873	.02766
7	.16649	.06729	.02798	.03179	.02977	.01448	.00459	.12281	.00822	.00889
6	.01220	.01438	.01160	.01092	.01238	.05425	.03431	.06652	.02122	.08581
0	.00563	.00652	.00545	.00635	.00752	.00960	.00221	.01012	.01143	.00621
2	.01474	.01090	.01044	.01223	.03325	.00846	.00455	.00414	.00618	.00527
0	.00692	.01329	.00915	.01016	.02480	.00555	.00291	.00479	.00608	.00533
6	.00029	.00156	.00083	.00199	.00304	.00019	.00014	.00015	.00033	.00020
0	.02938	.04274	.02967	.04999	.06087	.01667	.01525	.01598	.03213	.01497
2	.02075	.03093	.02612	.03129	.03029	.01548	.02808	.01481	.03316	.02184
2	.02203	.02513	.02071	.02333	.02697	.00658	.00311	.01307	.00586	.00613
7	.10511	.08237	.07175	.08659	.12315	.11283	.01775	.05820	.03646	.03635
1	1.50696	.10927	.09734	.13836	.07331	.00939	.00883	.00815	.00453	.00531
0	.10598	1.43892	.26186	.18102	.23256	.02568	.01360	.03964	.01602	.01671
3	.04753	.06774	1.19099	.06608	.06709	.01204	.00540	.01367	.00942	.00672
1	.03633	.02747	.06318	1.16725	.05872	.01082	.02283	.00579	.00584	.00469
2	.02243	.04019	.05751	.10077	1.22025	.02534	.01921	.00908	.01725	.00850
1	.05494	.06407	.03882	.04084	.04799	1.10399	.00905	.05424	.01711	.01871
3	.01122	.01143	.01433	.01220	.01298	.01446	1.02273	.00838	.01825	.01299
4	.05753	.03545	.02322	.02505	.02363	.01503	.01093	1.22737	.03052	.01127
8	.07835	.07642	.07447	.07089	.08274	.05815	.01678	.03805	1.03143	.03418
8	.05072	.04761	.04942	.04299	.04695	.08182	.04093	.03797	.09417	1.14736
7	.00308	.00302	.00396	.00401	.00387	.00132	.00095	.00127	.00475	.00519
1	.03012	.03188	.03303	.03579	.04655	.02941	.02801	.02698	.06220	.03731
2	.00411	.00415	.00380	.00325	.00409	.02764	.00245	.00484	.01007	.00408
8	.00260	.00246	.00229	.00236	.00250	.00182	.00299	.00165	.00181	.00301
7	.00188	.00164	.00132	.00125	.00172	.00185	.03099	.00063	.00217	.00219
1	.01550	.01279	.01017	.01204	.01159	.03363	.00819	.19468	.02390	.01852
5	.01995	.03771	.03060	.03797	.02896	.01331	.01495	.01307	.02726	.01163
6	2.44107	2.31643	2.17779	2.21516	2.33032	1.72355	.37574	2.01940	1.55183	1.58580

Electricity, Water, Gas, and Sanitary Services	Wholesale and Retail Trade	Finance, Insurance, and Real Estate	Hotels and Repair Services	Business Services	Automotive Services	Medical and Educational Services	Services, n.e.c.	Government Enterprise	Activities, n.e.c.	
00523	.00533	.01877	.00457	.00385	.00433	.00665	.00560	.02060	.02704	1
01812	.00873	.02766	.00717	.00756	.00659	.00720	.00712	.08768	.02566	2
12281	.00822	.00889	.01374	.01120	.02059	.01049	.01840	.03563	.02376	3
06652	.02122	.08581	.01524	.01937	.02825	.04265	.02760	.15653	.02011	4
01012	.01143	.00621	.00716	.00631	.00647	.01448	.00702	.04213	.08131	5
00414	.00618	.00527	.06549	.00974	.01862	.01333	.01779	.00641	.03398	6
00479	.00608	.00533	.00624	.00848	.00740	.00506	.01111	.00897	.03564	7
00015	.00033	.00020	.00161	.00033	.00065	.00020	.00122	.00024	.00102	8
01598	.03213	.01497	.04348	.09106	.02945	.03165	.03901	.02387	.42494	9
01481	.03316	.02184	.02701	.27960	.02744	.04288	.03396	.02021	.53081	10
01307	.00586	.00613	.01046	.00448	.02896	.00502	.01333	.01344	.01252	11
05820	.03646	.03635	.08926	.04630	.10833	.06873	.08707	.06872	.11874	12
00815	.00453	.00531	.01195	.01040	.02015	.00584	.04228	.00947	.03291	13
03964	.01602	.01671	.03097	.02708	.07515	.01989	.10790	.03534	.10283	14
01367	.00942	.00672	.01449	.04949	.03374	.00704	.05481	.00974	.04210	15
00579	.00584	.00469	.04283	.00892	.03633	.00624	.13039	.00714	.02823	16
00908	.01725	.00850	.06047	.04037	.19308	.03302	.39411	.01424	.19069	17
05424	.01711	.01871	.02476	.02751	.03219	.01946	.02967	.11771	.13380	18
00838	.01825	.01299	.01280	.09657	.01576	.01487	.01404	.01075	.01801	19
22737	.03052	.01127	.03331	.02386	.03637	.02908	.02059	.07246	.02490	20
03805	1.03143	.03418	.06673	.04408	.11717	.03673	.05285	.04744	.07910	21
03797	.09417	1.14736	.09402	.08956	.10311	.10804	.08690	.05313	.07052	22
00127	.00475	.00519	1.03606	.00759	.00241	.00695	.00305	.00223	.02996	23
02698	.06220	.03731	.04271	1.04913	.04240	.03866	.05219	.03114	.05267	24
00484	.01007	.00408	.01217	.00748	1.02015	.00401	.00276	.00930	.00690	25
00165	.00181	.00301	.00192	.00153	.00224	1.01690	.06411	.00105	.00372	26
00063	.00217	.00219	.00098	.00503	.00125	.00730	1.15194	.00098	.00523	27
19468	.02390	.01852	.01246	.03841	.01532	.01010	.00982	1.03936	.01691	28
01307	.02726	.01163	.02796	.03506	.02649	.03071	.03004	.01926	1.03523	29
01940	1.55183	1.58580	1.81802	2.05035	2.06039	1.64318	2.51668	1.96517	3.20927	30